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Mining in the Caucasus Mountains

By L. C. David*

SYNOPSIS—The property of the Caucasus Copper Co. makes use of a variety of labor, including Mohammedans, Persians, Georgians, Armenians and Greeks. The Mohammedans, from Turkey, form about 75% of the force and are good and steady workers, a strong reason being found in their religion, which prohibits the use of alcohol. Mining is by opencut and underground methods. Much of the overburden is removed by hydraulicking. Machine methods are used as much as possible, due to the labor scarcity.

The mines of the Caucasus Copper Co. are situated 6000 ft. above the sea level in the Caucasus Mountains of southern Russia, are 40 miles from Batum and a day distant from the Turkish frontier. The smelting and concentrating plants are in the Mourgul Valley, 2000 ft. below the mines. The mines are situated in the midst of Turkish farming settlements, and the whole country is beautiful by reason of its picturesqueness and the luxuriance of the vegetation. This disappears above the mines, and there are practically no farms at higher altitudes, most of the mountains above being covered with snow throughout the year.

Mine and Surroundings of the Caucasus Copper Co.

Varied Labor Obtainable

The labor at the mines was about 75% Mohammedan, from Turkey. These people are fair laborers, handy with a hammer, and efficiency can be attained by task work. The rest of the labor was Persian, Georgian, Armenian and Greek. The native Turks, Russian subjects, did little manual work, but acted as foremen, tallymen, etc. The more intelligent undertook contracts, such as drilling by the foot, moving overburden by the cubic meter, tramming by the ton, etc. They provided their own labor, kept their own timebooks, and personally looked after their own work. There is another excellent, though primitive, method in vogue called the *artel* system. In this plan a group of relatives or a group of covillagers undertake a contract to break or deliver ore to the crushing plant at a certain price per ton. The office keeps their time, and at the end of each month their payroll is made up; proper deductions are made and the net receipts divided pro rata. This method has proved acceptable to both the men and the company. Work is carried on seven days per week, and the labor is steady and regular in attendance. This is due partly to the fact that the Mohammedan religion prohibits the use of intoxicants.

Occurrence of the Ore

Ore has been found in so many places that we may almost say that the whole district is ore-bearing, except for intrusions of porphyry here and there. The ore occurs as a chalcopyrite finely disseminated through a matrix of quartzite. The grade of the ore varies in different places. We were doing most of our mining on a claim called Djangara, located in the foothills of Mount Kara Tepe. Generally speaking, the best ore is near the surface, and in opening up new ore it is not uncommon suddenly to find evidences of the old Genoese miners who did considerable work in this region about five hundred years ago. They mined a soft ore of very good grade. Most of their tools were of wood, and whoever happened to find one of these relics of antiquity prized it highly. The only remnants of their smelters that can be found are heaps of slag here and there in the mountains.

Removing the Overburden

Much experimenting has been done in the treatment of the ore, and only recently the proper metallurgical process has been decided upon. The ore was mined in a most economical manner by a combination of open-quarry and milling methods. The surface covering the ore varied

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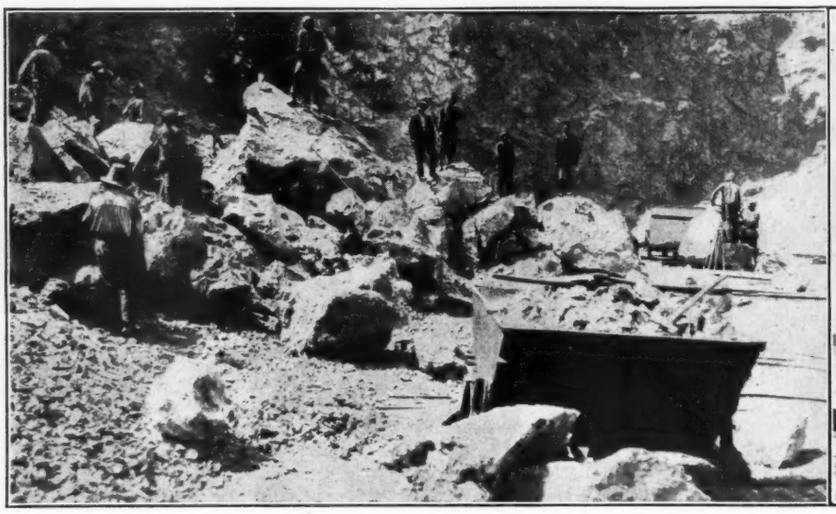
considerably in depth, and in some places the ore was capped with silica. In the early days overburden was removed by hand. This was possible with shallow overburden and low production. Later, hydraulic equipment was added, and when the production reached 1000 tons per day steam-shovel equipment was installed. This mechanical equipment was necessary on account of heavy demands for the ore as well as increasing depth of surface as we approached Kara Tepe. The water for hydraulicking was obtained from the mountain streams, and was available from March until December. From December to March heavy snows prevented the successful carrying on of this work. A dam was built in the largest stream and the water led from this through a paved ditch to a reservoir near the mine. From here two 16-in. pipe lines carried it to the operating giants. Flumes had to be constructed for disposal of waste to protect land and adjacent farms from erosion. The flumes were built in standard style, but the bottom was lined with about 6 or 8 in. of sharp silica rock set in cement. This gave more satisfaction than any lining that was tried. On account of an excessive quantity of boulders, as well as shortage of water, the first results were unsatisfactory. Intercepting ditches were cut to lead more streams to the dam, and the barrier dismantled and further hydraulicking carried on. In one instance, where it was desired hurriedly to uncover a small piece of ore that could not be reached with water direct, overburden was trammed in dump cars, dumped off a trestle and washed away by a giant. In order to remove more efficiently such surface we hauled up piecemeal a Model 41 Marion steam-shovel and erected it in place ready for work. This shovel was set up just before the Russian-Turkish war broke out; but we did not have time to bring up the locomotives and cars. We had planned our dumps on the cliff side of the mountain, which would have given us an economical means of disposing of the waste.

Mining Systems

The mine is opened by a tunnel and raises which are used as mill holes for the storage and handling of the ore. In the quarries the ore is blasted down on the floor below, broken to proper size, loaded into 3½-ton cars and trammed to the crushing plant. In the milling system the ore is blasted into the shafts, broken up and trammed out of the chutes to the mill. There is even practiced a combination of these two methods, in which the ore is broken down upon a flat, trammed to a storage shaft and



Jackhamers at Work in Opencut

A Turkish Drill Crew

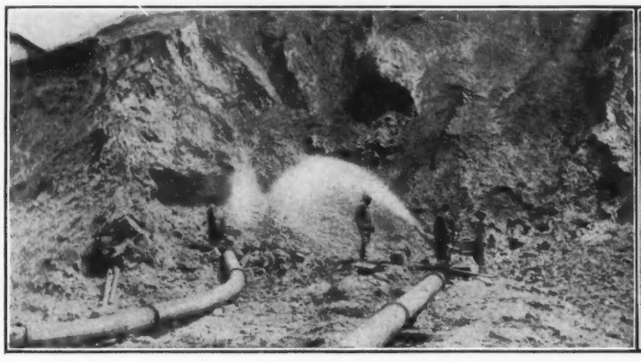
our work was confined to overburden containing fewer boulders. In order to get an outlet for the waste it was necessary to drive a tunnel through hard overburden to connect the hydraulic area with the flume. This tunnel was driven on a 13% grade and a flume or launder built inside. The launder was lined with sheet steel so as to reduce blockades to a minimum. A wooden barrier was constructed between the hydraulic area and the uncovered ore in order to prevent the mine workings from being flooded. This barrier extended from the tunnel to the limits of the hydraulic area. It was built with 6-in. posts and 2-in. plank. On account of the nature of the surface we had to build a floor extending from the barrier for a width of 3 ft. This floor, as well as the barrier, was lined with old screen cloth from the crushing plant, all joints being calked with waste. The floor was necessary so we could play on it with a giant and wash the waste material to the tunnel, in this way avoiding undermining the barrier. After the banks had been washed away for some distance from the barrier, a ditch was cut with the giant, loaded from chute into cars. A special type of chute was developed for this rough ore. It had a movable lip, raised or lowered by a 3-in.-pipe handle connected to the lip by a bail. By lowering, the ore would run into cars, and by raising the lip the flow stopped. This prevented spilling and allowed quick loading of the trains.

Machine and Hand Drilling

The ore is very hard. Drilling is done partly by hand and partly with machines. While we could do our drilling cheaper by hand than machine, on account of the cheap labor, nevertheless machines were an absolute necessity, as both the Balkan and the present war caused an acute scarcity of labor. According to Russian mining law it was necessary to maintain benches on the ore of specified dimensions in all open works. Our specifications called for benches not less than one *sagene* (7 ft.) wide and not more than two and a half *sagenes* high (17 ft.) The government district engineer made periodical visits to see that all governmental regulations were complied with.

Also, the law required that a responsible government *steiger* be employed by the company. The *steiger* is the personal representative of the district engineer and is charged with the duty of enforcing the regulations.

For bench work we employed 3¼-in. Ingersoll reciprocating drills, shooting as many as 60 holes by battery. The large masses were then block-holed with Jackhamers. In underground work, we used stopers to good advantage in raising. These seemed to be the best uses for the respective machines in this orebody. Drill runners, helpers and steel carriers worked on contract at a certain price per foot, and the best work was obtained in this way, all members of the crew being deeply interested. The breaking of all ore was done in the daytime; but in order to keep the crushing plant going steadily, ore was trammed both day and night. At night we were able to pull ore from the storage shafts. All tramming of ore was done by horses. The ore was delivered over a trestle to the crushing plant, which reduced the ore to 5 mm. in size. The crushing plant consisted of two sets of Blake crushers, three sets of rolls and necessary trommels. All crushing was done dry. Power for the crushing plant was generated by water power at the smelter and transmitted to the mines. This water power was not sufficient for all work and the extra energy needed was derived from oil-burning boilers. This oil, or *mazoot,* as it is called locally,



SURFACE-HYDRAULICKING OPERATION

is pumped through pipe lines from Baku, on the Caspian Sea, to Batum, and thence to the mines. Oil fuel was also used on our steam shovels.

From the crushing plant the ore was delivered by a 24-in. belt conveyor, 300 ft. long, to the ropeway loading station, from which it was taken to the concentrator below.

Bolivian Mineral Exports

U. S. Commercial Attaché A. I. Harrington reports the following exports of Bolivian mineral products in 1913, listed in the order of their value:

	Metric Tons		Metric Tons
Tin ore	44,594	Lead ore	1,765
Silver ore	81	Zinc ore	7,367
Copper ore	4,019	Gold bars	0.093
Bismuth ore	390	Bismuth ore (unconcentrated)	32
Copper ore (unconcentrated)	1,040	Iron ore	167
Wolfram ore	282		

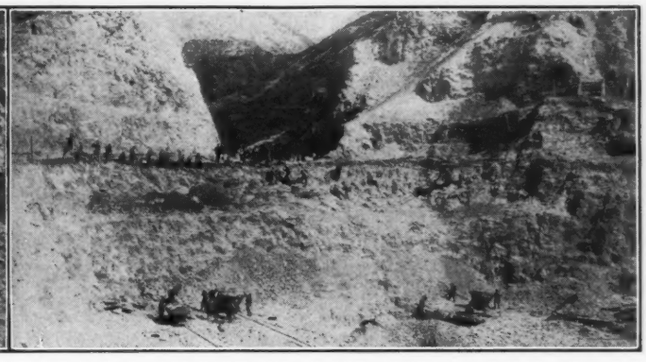
The total value of all products exported from Bolivia in 1913 was 93,721,513 bolivianos, of which 67,784,377 were represented by tin concentrates. Rubber comes next with a value of 14,651,647 bolivianos. It is interesting to note the distribution of the exported mineral products. Of the tin ore Great Britain received 42,282 tons; Germany, 2007; France, 265 tons. Of the copper ore, Great Britain received 2466 tons; Germany, none; France, 1801. All the wolfram ore went to Great Britain; of bismuth, 50 tons went to Great Britain and 342 tons to Belgium. All of the zinc ore was shipped to Germany. The term ore in this report evidently refers to rich, sorted ores and to concentrates in various stages of enrichment.

United States Rail Production

The production of rails in the United States in 1914, as reported by the Statistical Bureau of the American Iron & Steel Association, was the smallest since 1908. The total for the last three years, classified by processes of manufacture, was, in long tons:

	1912	1913	1914
Openhearth	2,105,144	2,527,710	1,525,851
Bessemer	1,099,926	817,591	323,897
Rerolled from old rails	119,390	155,043	95,169
Electric steel	3,455	2,436	178
Total	3,327,915	3,502,780	1,945,095

The decrease in 1914, as compared with 1913, was 1,557,685 tons, or 44.5%. The proportion of openhearth rails continued to increase, being 78.5% of the total in 1914, against 72.2% in 1913. No iron rails have been rolled for four years.



HAND DRILLERS AT WORK IN AN OPENCUT

Girder and high T-rails for electric and street railroads are included in the above-cited figures. For recent years the tonnage thus included was as follows: 1912, 174,004; 1913, 195,659; 1914, 136,889 gross tons. The total production of rails as given in the foregoing includes, in addition to new rails rolled in the year, rails rerolled from defective rails and from old rails.

The number of rail mills active in 1914 was 24, of which 10 were rerolling mills. Fourteen plants produced openhearth rails, nine Bessemer rails and one (Illinois) electric rails.

The production of alloy-treated rails, which was 257,324 tons in 1910, fell to 59,519 tons in 1913 and 27,937 tons in 1914. Of the latter number 23,321 tons were titanium steel and 4616 tons manganese steel. Only 490 tons of alloy rails were made by the bessemer process.

The classification of rails according to weight has been as follows for three years:

	1912	1913	1914
Under 50 lb.	248,672	270,405	238,423
From 50 to 85 lb.	1,118,592	967,313	309,865
Over 85 lb.	1,960,651	2,265,062	1,396,807
Total	3,327,915	3,502,780	1,945,095

The proportion of openhearth rails was largest in the heavier sections.

Wolframite in Lower Burma

By E. Maxwell Lefroy*

Southern Burma is chiefly comprised in the Tennasserim Division, which itself is split up into districts, and is bounded on the south by the Malay Peninsula of tin-producing fame, with the independent kingdom of Siam to the east. Of the two districts Tavoy and Mergui, the former is becoming known for wolframite, with cassiterite as a byproduct, which is obtained chiefly from quartz lodes carrying both minerals. In one proposition cassiterite alone is worked for, a suction dredge being used on this property.

The town of Tavoy has 25,000 people, is 32 miles up the Tavoy River and is headquarters for the local government. It is served by steamers from Rangoon and Penang and is the only port in the district. All ores are exported thence after they have been assessed for duty, which is at the rate of 2½% ad valorem. In the case of all wolframite concentrate the value is taken at the flat rate of $480 per long ton, irrespective of unit value.

The grade of wolframite is a high one and varies from 60 units of tungstic acid, the commercial minimum, to as high as 76%. The price per unit was steady in the German markets before the war at 33 marks ($6.69), and with increasing use of tungsten for steel hardening, for filaments and with some newly invented aluminum-tungsten alloys there appears little fear of a serious drop when the war is over.

Ample Water Supply for Hydraulicking

Tavoy has a climate of great humidity—the rainfall for a year to Mar. 31, 1914, was 196.62 in.—and is a district of steep hills and mountains, so that successful sluicing is a feature which may be highly developed. Hydraulicking will follow as the extensive hillside deposits, detritus and alluvials are opened out. Mining is confined at present to exploiting by adits, and is mainly effected by Chinese labor under white supervision. Payment is by result: From 20c. to 32c. per *viss* (3½ lb.) when on the lode; for crosscutting the rate varies from 48c. to 96c. per ft., according to the ground. Laborers do their own timbering, but buy candles and explosive.

In practically all cases crushing is effected by the miners using hand hammers and concentrating in cradles. Concentrate sells at from $430 to $600 per ton.

The bulk of it has been going direct to the Hamburg market, the assay made by the German government for duty assessment being accepted by buyer and seller. On concentrate from a concession known to carry ore of good quality local agents advance 85% of the market value on assumed grade of 65 units. The balance is paid, less interest on the advance, on realization.

The geological conditions are granite overlaid by metamorphic schists, sandstones or quartzites. These are of varying thickness, from nothing up to, probably, many thousands of feet. Schists are argillaceous, arenaceous and graphitic, being the last remnants of former sedimentaries which have in many cases been eroded to the intrusive plutonics. The generality of lodes strike more or less north and south—from 50° west of north to 30° east. Dip is in all cases to the east. In a number of instances lodes have followed from a schist capping a hill down into the granite without any marked variation being noticeable. The wolframite content has not diminished appreciably, though width of lode is not maintained, a width in schist of 2½-ft. average narrowing to a bare 2 ft. in granite.

Many Rare-Metal Minerals Found

The deposits are undoubted fissure veins, with WO_3 as secondary enrichment in the milky quartz gangue. Associated minerals are cassiterite, galena, pyrite, columbite, molybdenite, tungstite, muscovite, chlorite; but only the first named is of economic value as yet. That molybdenite deposits of commercial value will be found is the expectation of local mining engineers, as that mineral occurs disseminated in many veins. Monazite, samarskite and gold have also been reported.

Owing to the heavy rains from May to November prospecting is carried on with great difficulty. The rainfall is about 200 in. in those months, and the jungle growth proportionately rapid; so that it is certain, when taken in conjunction with the recent origin of prospecting, and yet more of mining—since 1908—that not a tithe of the wealth of the district has been disclosed. Even the continuity of the lodes for a reasonable vertical depth is unknown, though no one doubts that they do persist to at least 2500 ft. from hilltop outcrops downward. Thus the writer has traced one lode—out of 15 known to exist on a hillside 2000 ft. in horizontal length—for 7020 ft. on the slope. The vertical height was ascertained at 1912 ft. (the slope lay therefore at an angle of 16° with the horizon and the base length approximated 5000 ft.). This hill is entirely of granite, though rising as high as 3987 ft. above sea level. At just one mile distant and 2000 ft. lower the lodes exist in schist, and two series are comprised, the first striking due north and south and the other at magnetic bearing of 310°, with intersection and crossing of the other series. Each of these groups consists of many parallel lodes, which are typical of the deposits throughout the district. The widths vary from 3 in. to 4 ft. The dip varies from 50 to 80°. The mineral (WO_3) content for more than 4000 ft. of drifts on the lode has been proved at just 2½% of the veinstuff. The miners hand crushed and concentrated by cradle and only treated the obviously rich ore, throwing on the dump at the adit mouths fully 95% of the rock broken. Cradle losses have been proved as high as 28%. Two English companies are now installing or operating rolls and stamps for crushing.

A properly organized and equipped company taking over a concession worked on local lines will find many hundreds or thousands of tons of rock broken which, if the property is not a "duffer," will contain from 0.5 to 1% of wolframite.

Mining costs per ton of concentrate vary from $145 to $190, crushing, timbering, etc., included; supervision is $25 to $40; transport averages for the district $19 (bags included); office, insurance, freight, etc., $80 to $90; and duty, $12—making the total outlay vary from $281 to $351. On selling prices of $430 to $600 this leaves a handsome margin for profit.

For the year ended Mar. 31, 1914, returns are: Wolframite, 1622 tons 814 lb.; cassiterite, 68 tons 182 lb. The April output was 167 tons of wolframite and 4 tons of cassiterite. The wolframite return includes some tin ore, to extract which the concentrate is sent to Penang for separator treatment.

*Consulting engineer and mine manager, Tavoy, Lower Burma.

Gold Dredging in the Philippines*

SYNOPSIS—A review of the dredging practice that has been evolved in digging difficult but rich ground in the tropical environment of the Island of Luzon. Most of this development has taken place in the Province of Ambos Camarines during the last five years; other areas are now being investigated.

Placer mining has become one of the most important of Philippine industries. The recognition of the value of the alluvial deposits of gold in the islands came only after a long period of experimentation and the usual tale of hardship and struggle. However, the growth of the industry during the last three years has been rapid. During that time two old dredges which before had failed to pay have been put into successful operation; three new dredges have been completed; two are nearing completion, and three others are soon to be constructed, with promise of even more in the future.

Dredging Most Active in Ambos Camarines

Gold-bearing alluvium has been found in Cagayan, Ilocos Sur, Mountain, Pangasinan, Nueva Ecija, Bulacan, Rizal, Tayabas, Ambos Camarines, Catanduanes, Mindoro, Masbate, Panay, Surigao, Butuan, Misamis, Bukidnon and Zamboanga. Of these districts, only Ambos Camarines is at present producing gold on a large scale, but three others, Tayabas, Rizal and Surigao, are now installing machinery and will be operating in the near future.

At present six dredges are being operated in Ambos Camarines: One by the Gumaos Placer Co., two by Philippine Dredges, Ltd.; one by the Maximelo Gold Dredging Co., one by the Malaguit Gold Dredging Co., and one by the Philippine Dredging Syndicate. Philippine Dredges, Ltd., is constructing three other dredges, one wooden-hull dredge with 8.5 cu.ft. close-connected buckets, one with 6-cu.ft. close-connected buckets and an all-steel dredge, with 9-cu.ft. close-connected buckets, which is being built in Australia. In 1913 four dredges operated during the entire year and one operated for about six months. The gold produced from these dredges in 1913 amounted to 643,776 pesos ($321,888, U. S. currency).

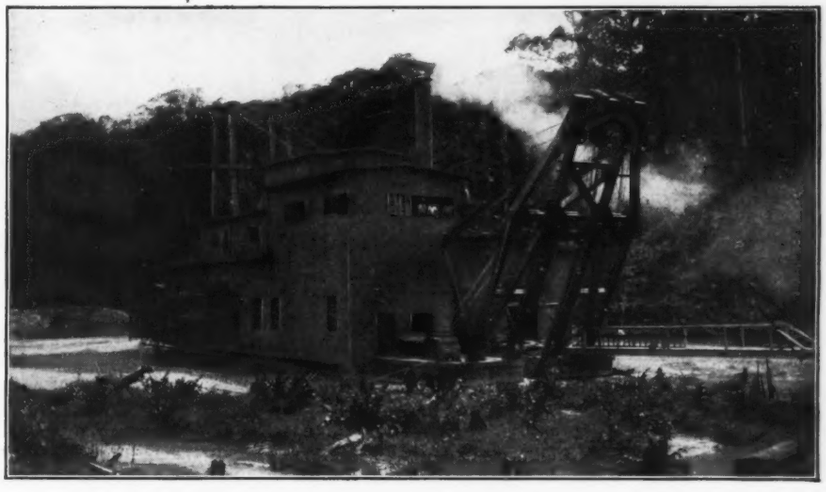
In the Philippines probably more different types of dredges are represented than in any other district in the world. There are in operation or in process of building, locally, one or more dredges of the following types:

1. Loose-connected or link-bucket type; revolving screen and one bank of tables on each side; controlled by head-lines and side-lines; no stacking ladder used.
2. Loose-connected or link-bucket type, without screens or side tables, but with two long sluices one above the other, fitted with several different types of riffles; controlled by head-lines and side-lines; no stacking ladder.
3. Close-connected buckets, with revolving screen, two banks of tables on each side, and stacking ladder; controlled by spuds and side-lines.
4. Close-connected buckets, without screens, with long central sluice and undercurrents on each side, no stacking ladder; controlled by head-lines and side-lines.
5. Close-connected buckets, with revolving screen, and single bank of tables on each side; no stacking ladder; controlled by spuds and side-lines.
6. Loose-connected buckets with screen and shaking tables, also after table and save-all; no stacking ladder; controlled by head-lines and side-lines; hull of steel.

Character of Ground

The placer areas in the Philippine Islands are small as compared with other famous fields, but are sufficiently large to offer profitable work. It is interesting to note that, except for a few feet of surface, all the ground dredged in the Philippines has been below sea level, and that the tide flows nearly to the head of the rivers on which the dredges are situated.

The gold in general is much more angular than gold found in placers in other countries. It is usually fine and occurs as small well-shaped crystals. Only a small quantity of rounded gold has been found. The only exceptions found so far are at Cansuran, Surigao, and at Umerai, Tayabas. An unusual feature is found in Paracale and Malaguit Rivers in the fragments of gold-bearing quartz picked up by the dredge. These vary from pieces the size of a pea to boulders weighing 100 kg. Gold is found in these boulders filling pockets or vugs; it is fine and crystalline, forming a spongelike mass.



Gumaos Placer Co.'s Dredge in Ambos Camarines, Island of Luzon

The gold in the Paracale district is usually found in the layer of gravel next to the bedrock and also filling the crevices and cracks of the bedrock. The gold-bearing gravel varies from 0.3 to 3 m. (1 to 10 ft.) in thickness. Little or no gold is found in the sands and clays which overlie.

At Gumaos little or no black sand or pyrite is found. At Paracale and Malaguit, however, large amounts of magnetite, ilmenite, pyrite, and some metallic copper, with other accompanying heavy minerals, are found in places. In Nueva Ecija the gold is even finer than at Paracale, and exceedingly large amounts of black sand are found, which make the saving of gold difficult.

*An article in the "Philippine Journal of Science" by William Kane, superintendent of the Gumaos Placer Co., Manila, P. I.

On Paracale and Malaguit Rivers there are mangrove roots and soil for about 2.4 m. (8 ft.) in depth. Below this is a layer from 3 to 6 m. (10 to 20 ft.) of black sticky clay or "pug"; under this is a thin layer of sand and below that is the pay gravel, which is from 0.3 to 1.5 m. (1 to 5 ft.) thick. The bedrock is a decomposed granite or gneiss, and is well adapted for dredging.

Deepest Dredging at Gumaos

At Gumaos there is about 1 m. (3 ft.) of soil, then 3 m. (10 ft.) of yellow clay and from 6 to 9 m. (20 to 30 ft.) of black clay or pug, below which is the layer of pay gravel, which varies from 0.3 to 4.5 m. (1 to 15 ft.) in thickness. There is little quartz in this gravel, and none of the quartz is gold-bearing, such as is found in Paracale. The ground, so far worked, has yielded from 30 to 90 centavos (15 to 45c., U. S. c.) per cu.yd. Some patches have been dredged that yielded as high as 2 pesos ($1) per cu.yd. The greatest depth dredged is 15 m. (51 ft.), while the average depth is about 11 m. (35 ft.).

The gold is unevenly distributed throughout the Paracale district, and for this reason, unless drive pipes are put down every 100 ft., even an approximate value can not be obtained. Where the gold-bearing gravels are thick, the gold contents shown by drive pipe seem to check fairly well with the dredge output, but where the gravel bed is thin the results cannot be depended upon. Besides this, the gold is found in irregular streaks on the bedrock, and a drive pipe cannot be relied upon in such ground. Nevertheless, it is important that all placer properties be thoroughly tested in order to obtain even an approximate idea of the value of the ground. To do this it is essential that a good machine, making a bore no smaller than 9 cm. (3.5 in.), be used and that a man be in charge who thoroughly understands the proper use of the machine.

The difference between Philippine placer ground and that in other countries, as shown so far in working with dredges, is the extremely large percentage of fine material and clay in the former. In California only from 30 to 40% of the material dredged passes through the screens, and it is generally composed of clean sand with little clay. In this country the alluvium has undergone weathering and decomposition, due to the extreme oxidizing power of the elements in the tropics, and the result is the production of clay and soil so that from 70 to 80% of the material dredged passes through the screens. It also has the disadvantage of being made up largely of clay which is sticky and hard to disintegrate, resulting in loss of gold. Even the gravel bed in which the gold is found has undergone considerable decomposition and has produced clay.

Philippine Dredging Practice

The character of the Philippine placers presents an element in dredging that requires special attention and methods of treatment somewhat different from the usual practices. It appears from tests made on the tailings and on samples taken from the buckets that the present dredging practice recovers only from 60 to 85% of the gold in the ground. Because of the unreliability of drive-pipe tests in these deposits, samples taken in this manner are the only means of testing the efficiency of the dredge. Dredging men are beginning to realize this, and are gradually changing the design of the dredge to suit conditions. The principal changes which would seem to be advantageous are increased screen area and increased water pressure at the nozzles which play upon the screens. With suitable screens and water pressure, it is my belief that ground averaging 25 centavos (12.5c. U. S. c.) per cu.yd. can be profitably worked with dredges having buckets up to 7 cu.ft. capacity. With larger dredges and cheaper power, costs could probably be reduced still further. However, the adaptability of very large dredges to ground of this character is questionable.

The first principle in dredge building is to have a hull of sufficient strength to support rigidly the great weight of machinery and to withstand the excessive strain to which it is subjected when the dredge is digging, particularly the shock caused by the changing pitch of the bucket line. If any weakness develops, the machinery is apt to be thrown out of alignment, and excessive wear or breakage results.

Oregon-Pine Hulls

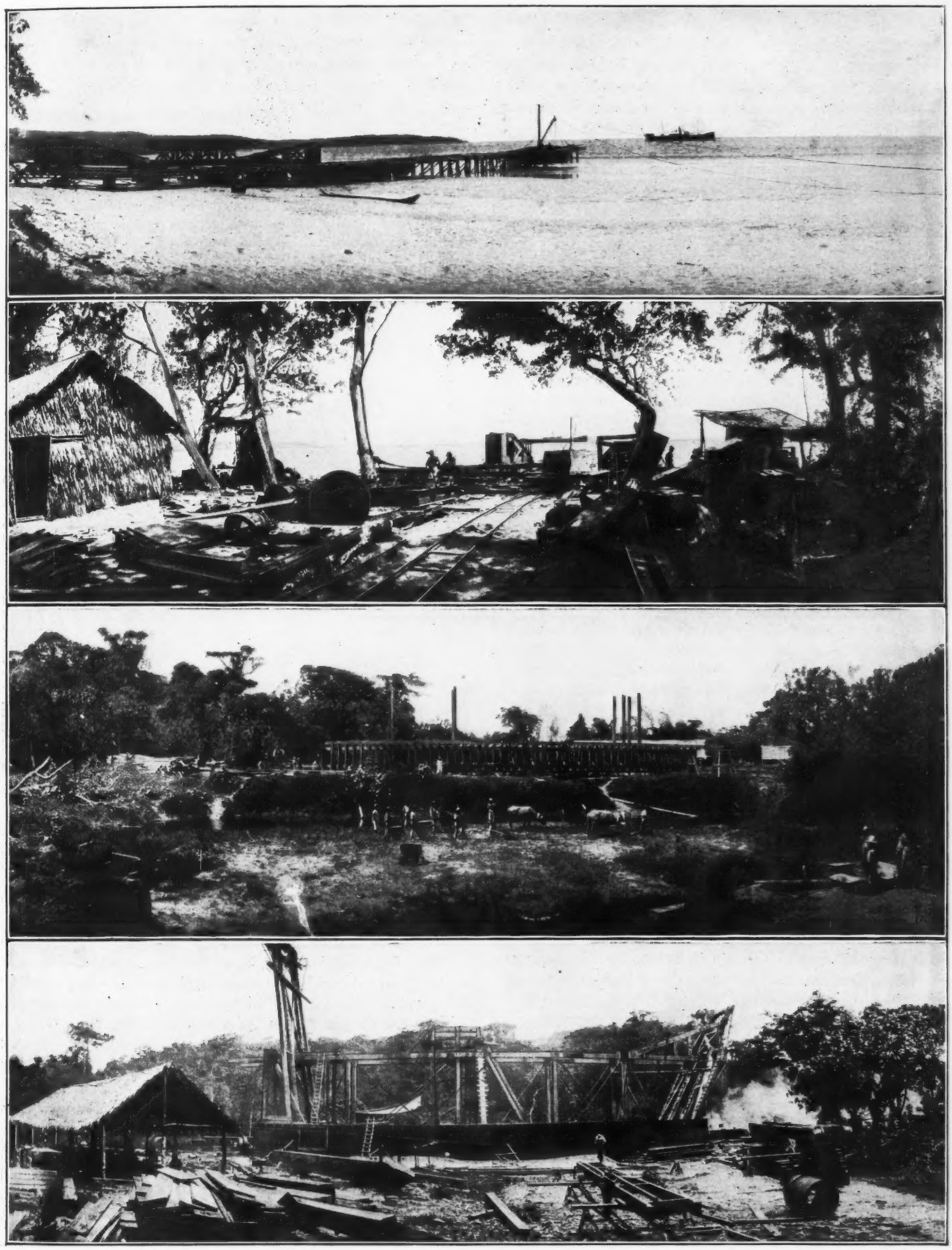
Steel hulls have not yet been tested in the Philippines. Steel has been proved superior to wooden hulls when working in fresh water, but when working in salt water, as is the case in the Paracale district, its superiority is questionable. Furthermore, the tendency toward rapid oxidation in the tropics may be a serious handicap to a steel hull. Philippine pontoons have been made of native wood and also of Oregon pine. It appears from evidence so far obtained that Oregon pine is on the whole more satisfactory. However, the Philippine wood used was not representative of the best Philippine wood, and therefore should not be taken as an example.

It is essential that all construction of Oregon pine should be well reinforced with steel plates, and in all cases the hull should be well ventilated. The pontoon should also be sheathed with tarred felt, covered by 1.5-in. boarding, to protect the hull from teredos and fresh-water borers. This is a precaution peculiar to the tropics where such water animals are found.

Ordinary Buckets Unsatisfactory in Clayey Ground

In order to handle the clay encountered in the deposit and to secure a proper capacity, it is necessary to have a specially designed bucket. Ordinary buckets designed for handling gravel are almost useless. The body of the bucket should be short and the lip cut well back to insure quick and clean dumping. In the Philippines, as elsewhere, the close-connected buckets have many advantages over open-connected buckets. It is an advantage to have the machinery so designed that the buckets can be driven fast while digging the overburden and more slowly while digging pay gravel and bedrock. A larger quantity of clay can be handled by moving laterally more rapidly and by decreasing the distance through which the digging ladder is lowered on each swing. The wear on buckets and on the digging end generally is light in the Paracale district because of the soft material handled.

Dredges are operating in the district with spuds and also with head-lines. There are advantages claimed for each system. If the operator desires to strip the overburden for about 3 m. (10 or 12 ft.) ahead of the work-



LANDING THE EQUIPMENT AND ERECTING A DREDGE IN THE PHILIPPINES

The accompanying engravings present scenes during the erection of the Gumaos dredge, in the Province of Ambos Camarines, by the New York Engineering Co. The top views show the dock and lighter built to land the Gumaos equipment from the steamer in the offing. The lower views show the dredge hull at various stages of construction, the completed dredge being shown in action on the first page of this article.

ing face and then drop back to clean up the gold-bearing gravel, the head-line is preferable, but the modern practice in the United States is to use spuds, holding the dredge right to the face and working to bedrock with each step. It is also claimed that the use of spuds saves time by eliminating the handling of heavy head-lines, which is especially difficult in a wooded country.

The modern screen is a revolving cylindrical screen, constructed with a framework of heavy channel irons, to which perforated plates are bolted. This makes it possible easily to replace the perforated plates, which have to be renewed about once every nine months. The plates are about ⅜ in. thick, and the perforations vary from ¼ in. at the upper end to ½ in. at the lower end.

Paracale River Dredges Operate without Screens

The dredges on Paracale River are operating without screens. The material is dumped into a large sluice, and water is supplied through nozzles at the head and also at several points along the sluice to assist in breaking up the material. For about 9 m. (30 ft.) from the head the material passes over stationary perforated plates. The undercurrent from the perforated plates passes out over wide tables which are fitted with riffles and placed on each side parallel to the box. After passing over the tables the material is returned to the main sluice. The overflow passes straight down the main box, which below the plates is fitted with heavy angle-iron riffles. There is also a clay sluice through which the valueless overburden can be passed, thereby relieving the tables and sluice from performing unprofitable work. This system is similar to that used in hydraulic mining in all parts of the world and is still used in dredging in New Zealand and Australia, but is not used in dredging in the United States; in Alaska it is called flume dredging. It appears that this practice would be good where there is not an excessive amount of clay and where there are not many large boulders, which have to be removed by hand from the sluice box.

The revolving screen with high-pressure nozzles would seem to be best adapted for material with a large percentage of clay and also wherever a stacking ladder is necessary.

Use of Mercury Increasing

On account of the fineness of the gold and the large percentage of fine material in the wash, the table area should be larger than usual. About 80% of the gold is caught in the first few feet of the first four tables where mercury is used in riffles. The advantage of using mercury is marked, and its use is now considered the best practice. The use of matting and expanded metal is decreasing, and is being replaced by riffles and mercury.

The general practice is to clean up the main tables at least once a week and the side sluices once a month. In cleaning up, the riffles are lifted and the entire material left on the tables is collected and washed in a streaming-down box. This practice is adopted on account of the unreliability of the laborers. The tables on dredges using screens and a distributing box can be cleaned up in sections while the dredge is in operation. The sluice-box type without screens necessitates a shutdown before the main sluice can be cleaned up.

It is advantageous to have the pumps driven by a separate engine and not from the bucket engine. There should be at least two pumps—one high-pressure and one low-pressure—rather than one low-pressure pump of large capacity, especially where much clay is encountered.

Power Problem Serious

Power is becoming a serious problem in the Paracale district. The available wood supply is being rapidly exhausted, coal is expensive, and oil fuel is now receiving serious consideration. It appears that Diesel engines would furnish by far the cheapest power. A central electric power plant run by Diesel engines would be an excellent solution of the problem.

A representative force of men required for a dredge in the Philippines is shown in the accompanying table. The cost of operation per cubic yard, representative of the best practice, is also shown.

DREDGE CREW IN THE PHILIPPINES

Dredge force per shift:	Pesos[1]
1 white winchman, per month	250.00
1 native winchman, per day	1.25
1 native fireman, per day	1.25
1 native greaser, per day	1.25
9 native laborers, per day	1.00
Additional day force:	
1 white mechanic, per month	300.00
1 Japanese blacksmith, per day	3.35
1 native blacksmith helper, per day	1.00
2 native assistant machinists, per day	1.50
1 native boss, per day	2.00
5 native laborers, per day	1.00

OPERATING COST OF PHILIPPINE DREDGE

	Pesos per Cu.Yd.
Labor, white	0.03
Labor, native	.027
Superintendence	.010
Fuel	.044
Supplies	.005
Repairs	.015
Total	0.131

About the best work that a dredge has done so far has been to operate throughout 75% of the working days. Most material made of iron and steel has a life about two-thirds as long as in the temperate zone. This is particularly noticeable in wire cables exposed to salt water. The distance from the base of supply makes it necessary to keep in stock a large supply of extra parts. Any unlooked for breakage is expensive for this reason, and may cause a delay of from one to three months.

German Steel Production

The German Iron & Steel Union reports that the production of the steel works in Germany, which fell to 663,223 metric tons in September, gradually increased to 941,399 tons in December. The total for the year 1914 was 14,973,106 tons, which was a decrease of 21% from 1913. At the close of 1914 there were 245 steel-making plants in operation.

The production of the German steel works for the full year was as follows, in metric tons:

	Basic		Acid		Total	
	Tons	%	Tons	%	Tons	%
Converter	8,169,183	54.6	100,617	0.7	8,269,800	55.3
Openhearth	5,946,215	39.6	274,321	1.8	6,220,536	41.4
Direct castings	211,095	1.4	87,243	0.6	298,338	2.0
Crucible	.....	....	95,096	0.7	95,096	0.7
Electric	.....	....	89,336	0.6	89,336	0.6
Total	14,326,493	95.6	646,613	4.4	14,973,106	100.0
Total, 1913	18,222,598	96.2	736,221	3.8	18,958,819	100.0

The total production for 1914 shows a decrease of 3,985,713 tons, or 21%, from that of 1913. Most of the

[1] One peso equals 50c. U. S. currency.

loss was due to the war, but in the first half of 1914 there was some decrease in production owing to depressed business conditions. The output for 1913 is the largest on record. Owing to the unusual conditions of the year no special deductions can be drawn from the figures.

Stated comparatively, the production for three years was, in metric tons:

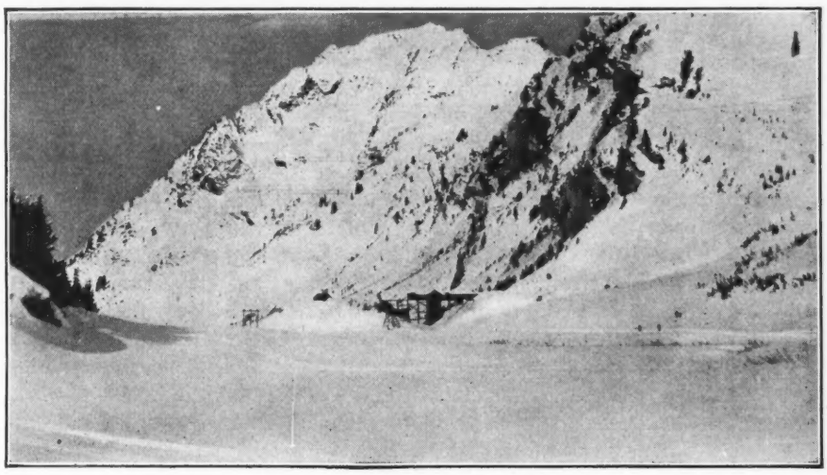
	1912	1913	1914
Converter	9,981,479	10,784,835	8,269,800
Openhearth	6,845,489	7,610,140	6,220,536
Direct castings	321,663	362,916	298,338
Crucible, etc	153,367	200,928	184,432
Total	17,301,998	18,958,819	14,973,106

It is remarkable that, with dull business in the first half of the year and war conditions in the second half, the steel production of 1914 should have kept up to 79% of that reported in 1913, an exceedingly prosperous and active year.

Some Alta Activities

SPECIAL CORRESPONDENCE

Alta is situated in Salt Lake County, Utah, at the head of Little Cottonwood Cañon in the Wasatch Mountains. This is a typical glacial cañon, with a large terminal moraine at its mouth and a lateral moraine on the south side. The sides of the cañon are precipitous and the formation is exposed all the way to the head. In succession, coming up the cañon, are quartzite, granite, quartzite, lime and overlying quartzite. The quartzite and lime dip NE 60° at an angle of 35°.



IN LITTLE COTTONWOOD CAÑON

The upper contact of the lime and quartzite is attracting considerable attention at the present time. This contact strikes NW 30° and dips 35° easterly. It is cut by several fissures striking northeasterly and southwesterly; also by another series striking more easterly and westerly. All these fissures dip in a northerly direction.

ORIGIN OF ORE

The large orebody of the old Columbus, called No. 5 stope, was formed at the intersection of the Brain fissure and this contact. About $1,500,000 worth of ore was taken out of this stope. Recently the Cardiff developed a large orebody at the intersection of this contact and the South Fork fissure. It is estimated there are 140,000 tons of ore developed and partly developed that assays from $25 to $40 a ton. There is also some much higher grade ore, but no figures regarding it are available.

These orebodies are a replacement of the lime. The mineralization is due to the fissures, and the lime only affords a field where small fissures can make large orebodies. So much has been said of this contact lately that a great many people believe the mineralizing agents followed the contact. This is not true, as the contact is barren except in the vicinity of an ore-bearing fissure. It is true that the fissures have mineralized the contact some distance each way, but that is only on account of the solubility of the lime.

It is the recent development of this new orebody in the Cardiff that has given the present impetus to Alta mining. It has not the earmarks of a boom, but there is considerable activity, and more is expected.

COLUMBUS EXTENSION

The Columbus Extension drove approximately 5000 ft. of crosscut tunnel in a northerly and northwesterly direction, cutting five well-defined fissures. These were all cut in the overlying quartzite and no attention was given to the contact. These fissures are from 2 to 15 ft. wide. Some shipping ore has been mined and a large tonnage of mill ore defined. One of these bodies of mill ore is a replacement in a bed of soft quartzite and is about 30 ft. wide. It assays 6% Cu, 10 oz. Ag and a small percentage of lead.

The objective of the Columbus Extension tunnel was the big Toledo fissure. This strikes northeasterly and southwesterly, the filling cropping near the top of the ridge, and dips about 60° in a northerly direction. This is the strongest and most persistent fissure in the camp. In the early days a great deal of high-grade silver ore was mined from the Toledo fissure, from the surface to a depth of 400 or 500 ft. The Extension tunnel will cut this fissure at a vertical depth of 1400 ft.

The present management crosscut from the face of the tunnel 230 ft. to the contact with the intention of following the contact to the Toledo fissure, feeling assured of a large orebody at the fissure. After drifting only 85 ft. there was cut an unknown fissure 5 ft. wide, striking NF 20°, on which they are now drifting into the lime. Assays average 48% Zn, 7% Cu, 10% Pb and 18 oz. Ag. The face of the contact drift has advanced 100 ft. beyond this zinc fissure and shows 2 ft. of vein material on the contact, with some zinc and copper ore scattered through it. The Columbus Extension is working 10 men at present. Compressed air and electric power are furnished by the Wasatch Mines Co. The electric power is used for driving a 36-in. fan connected for suction through a 10-in. pipe line. The fan is driven by a 15-hp. motor at 1000 r.p.m. The tramming is done with horses, but electric haulage is contemplated.

Ore transportation is cheap, amounting to $2 per ton landed at Midvale or Murray. The ore is carried 3 miles by aërial tram and 2½ miles by wagon to the Wasatch terminal of the Salt Lake & Alta R.R., which connects with the Denver & Rio Grande at Midvale.

South Hecla

The South Hecla owns 550 acres of ground on the south side of Little Cottonwood Cañon, almost directly opposite the Columbus Extension. At present this company is drifting on the Wedge fissure in the lime. This is a northeast-southwest fissure. It has been opened 800 ft. on the 250-ft. level and 900 ft. on the 500-ft. level. The property is worked through a tunnel and the levels are referred to perpendicular distances from the surface. The ore averages 18 ft. wide and assays 0.03 oz. Au, 25 oz. Ag and 15% Pb. There are 5 miles of underground workings, and the property is splendidly equipped throughout. Ore is shipped only during the summer months. Last year 5000 tons were sent to the smelter, for which $104,000 was received. Fifteen men are working at present, but the force is greatly increased during the summer.

Cottonwood Cañon has a very heavy snowfall, which interferes seriously with mining during the winter, and heavy and disastrous snowslides are not infrequent. The rugged character of the country is shown in the illustration, as well as a typical snowfall, which has almost completely buried the miners' cabins to the right of the ore bin.

The Alta Consolidated claims are developed by 5000 ft. of tunnels and other underground workings and have produced about $100,000 gross since incorporation. The latest work in the west drift from the tunnel level on the Brain fissure has developed 1½ ft. of rich sulphide ore that will net about $60 per ton. At the present time a winze is being sunk on this ore to intersect a quartzite-lime contact, which is similar to the one which made the large orebodies in the Columbus Consolidated and the Cardiff. The east drift is being driven to get under the orebody of the old Matilda mine, which was a heavy producer in the early days and is now a part of the Alta Consolidated holdings. There is also a large bedded vein 40 ft. thick of sulphide ore, carrying copper, gold and silver, traversing the property northwesterly and southeasterly for approximately 1500 ft. It is intended to develop this by running a tunnel from the workings of the old Flagstaff, which are now in over 4000 ft. This proposed tunnel would intersect this bedded vein at a depth of over 700 ft. vertically below the present tunnel level and would give backs of over 1000 ft. of ore. This proposed tunnel would also serve as an outlet and working tunnel to develop the entire mine and furnish drainage facilities. Other companies will join with the Alta Consolidated in running this tunnel.

Mineral Output of Italy in 1913

According to the official reports in *Revista del Servizio Minerario nel 1913,* there were 645 producing mines in Italy in 1913, which were divided as follows: Sulphur, 359; lead and zinc, 99; coal and oil shale, 40; salt, 31; iron, 22; graphite, 22; asphalt, 17; pyrites, 10; petroleum, gas, etc., 9; mercury, 8; copper, 8; borax, 8; manganese, 4; all others, 8. The total number of laborers employed under and above ground was 45,407.

The output of principal minerals was as follows, the items being arranged in order of descending values: Sulphur, crude, 2,452,474 metric tons; zinc ore, 158,278; iron ore, 603,116; silver-lead ore, 44,654; lignite, 697,319; iron pyrites, 292,077; mercury ore, 109,379; asphalt and bitumen, 171,097; copper ore, 89,487; petroleum, 6572; borax, 2410; salt, 17,727; rock salt, 41,323; copper pyrites, 25,257; graphite, 11,145 metric tons; natural gas, 6,015,000 cu.m.; mineral waters, 25,700 metric tons; gold ore, 2047; antimony ore, 1822; alum, 5976; manganese ore, 1622; tin ore, 274; bituminous schist, 2640; lead and zinc ore, 504; bituminous coal, 1120.

The principal metals produced, exclusive of iron and steel, were: Lead, 21,674 metric tons; mercury, 1004; aluminum, 874 metric tons; silver, 13,094 kg.; antimony, regulus and sulphide, 76 metric tons.

Quarry products were: Bauxite, 6952 metric tons; pumice, 14,973; talc and steatite, 24,001; barytes, 12,970; quartz and feldspar, 32,268; marble, 509,342; kaolin, 11,920; refractory materials, 5560 metric tons.

The Galician Oil Fields in War Time

J. R. Falkowicz, a petroleum expert, who returned to London in March from a special visit to the oil fields of Galicia, has been interviewed by a representative of the London *Financial Times,* which presents an interesting account of conditions in this field. Mr. Falkowicz went via Norway and Sweden to the Finnish frontier, and as there is no connection between the Swedish and Finnish railways, a short sleigh journey had to be taken to the first station in Finland. Then came a long railway journey to Petrograd, and from Petrograd to Galicia, in the footsteps of the Russian army.

Once at Lemberg—which is the residence of the Russian military governor general—the journey to the oil fields, a hundred miles distant, had to be made by horse conveyance, for no trains were running and there was no such thing as a motor car to be had. Moreover, at the time of Mr. Falkowicz's visit the country had been entirely cleared of food, first by the retreating Austrian army and next by the advancing Russians. Further, there was no money available, as all the banks had been closed and the cash removed. The only people left were a few minor officials and a considerable number of workmen, who had not been paid their wages since the outbreak of war. Mr. Falkowicz said:

On going over the oil fields I found that the oil properties generally had not suffered during the recent fighting. Finding the workpeople were in a state of semi-starvation, I obtained the immediate and full assistance of the Russian governor general in arranging for regular food convoys from Russia into the district. The food question having thus been solved, it became possible to reorganize the work, and in due course I was able to restart operations on some of the properties.

The oil fields, generally speaking, have suffered no damage by the fighting. Whatever damage was done affected chiefly the private property and the houses of the inhabitants and of the various staffs of the companies. These suffered badly from loot and pillage. For this, however, the ordinary hungry mob which followed the army is more responsible than the Cossacks. Almost every private house and every office was entirely ransacked, even to the nails in the walls. People walking in the roads were, in spite of the cold, the frost and the snow, deprived in broad daylight of their fur coats and their boots. On such of the oil properties as were left without anybody to look after them, everything movable, chiefly beltings, metal fittings and even metal bearings from engines and boring rigs, began to disappear. In some instances whole derricks were dismantled by the thieves. We started to stop this by keeping a watchman, but more than once we found the watchman killed. We then began to keep gangs of three or four watchmen, but this was too expensive. We therefore decided to restart full work, as the best way of keeping off the thieves, and this is how we gradually. came to organize working on the fields.

Tendency of American Milling Machinery Practice

By Julius I. Wile*

SYNOPSIS—Late tendency in milling machinery in America has been toward the removal of the expensive older types where they are not essential, and the application of machinery particularly adapted to each class of ore to be handled. Stamps are being shown to be not the best in many cases, but may be replaced to advantage by other machines. Disk grinders, rolls, ball mills and tube mills are discussed, and their application in various cases indicated.

The past few years have brought forth such a multiplicity of designs and processes for the reduction of costs and the increase of extraction from low-grade ores that milling engineers are somewhat confused as to just what is the best type of machinery to be used for any particular ore. Having been connected with one of the large milling-machinery manufacturers, I have had an opportunity to investigate the different machines and processes used in various camps throughout the United States and Canada, and the object of this article is to place on record the results of my observations according to my interpretation of them.

It is a well-known fact that crushing machinery best suited for the ores of one district may not be suitable for another where the ores are entirely different in composition and in resistance to crushing. For the simplification of machinery requirements, I would divide ores into two classes, placing ordinary ores in class A and the tough ores in class B. I would put ores in the various districts in the United States and Canada in general for the purposes of this article in the following list; and it will be particularly noted that most of the ores come under the class A division. It is difficult to draw an absolute line of division between these classes, but I doubt if engineers can find much objection to placing ores of below 25,000 lb. per sq.in. crushing resistance as ordinary, or class A ores, and those above that as tough, or class B ores

CLASS A, ORDINARY ORES

Porcupine gold ores, Ontario, Canada.
Utah porphyry copper ores.
Arizona copper-carbonate ores.
Coeur d'Alene, Idaho, lead and zinc ores.
New Mexico porphyry-copper ores.
Missouri lead and zinc ores.
British Columbia copper ores.
Arizona porphyry copper ores.
Nevada gold ores.
Montana copper ores.
Montana zinc ores.
Wisconsin zinc and lead ores.
California gold ores.

CLASS B, TOUGH ORES

Cobalt, Ontario, Canada, silver ores.
Pearce, Arizona, gold ores.
Kingman, Arizona, gold ores.
Tonopah, Nevada, silver ores.
Michigan copper ores.

The division of stage crushing required to crush mine-run ore to pulp, whether for amalgamation, concentration, flotation or cyaniding, no matter what ultimate degree of fineness is required, I would separate into three stages—breaking, crushing and grinding. The principal machinery now being used I find to be as follows:

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CLASS A, ORDINARY ORES

Breaking—Iron Blake-type crushers or gyratories, reducing mine-run to 1½in., or to 3½ in., with Symons disk crushers to 1½ in.

Crushing—	Feed	Product
Ball mill	1½ in.	10 mesh
or rolls	1½ in.	4 mesh
or disk	1½ in.	⅜ mesh
Grinding—		
Pebble tube mills	⅜ to 10 mesh	—30 to —200 mesh

CLASS B, TOUGH ORES

Breaking—Steel Blake-type crushers, reducing mine-run to 1½ in., or 3½ in. and using disk crushers to 1½ in.

Crushing—	Feed	Product
Stamps, heavy	1½ in.	3 mesh
Disk	1½ in.	⅜ mesh
Grinding—		
Pebble tube mills	⅜ in. to 3 mesh	—30 to —200 mesh

Among the points to be considered in this article is the old question as to whether stamps, particularly for gold milling, are at last going to be discarded. I believe the tendency is that they will be, in most cases, in favor of ball mills, while still being retained in special cases, such as for very tough ores, where high iron consumption makes the use of ball mills prohibitive. I also believe in the pebble-tube mill for finishing, whether for 30, 60 or 200 mesh, its adaptation to coarse as well as fine feeds and its ability to produce a coarse as well as a fine product depending largely on the type of the discharge.

Preliminary Breaking

In smaller mills, up to 200 tons of daily capacity, the primary breaking is usually done in iron Blake machines reducing to 1½ in., while for tougher ores, as in class B, the minimization of breakage makes the steel Blake the most suitable. In such mills the size of the primary breaker is usually not larger than a 10x20-in. opening, the ore being broken in the mine to this size. In mills for 1000 tons and larger it is becoming more and more the practice to break to larger sizes in the mine, or use a steam shovel, and install large-size primary breakers. Blake breakers are now made with openings as large as 48x90 in. Gyratory machines are also used for primary breaking, but their complexity as compared to the simplicity of the Blakes for repairs and their high cost of repairs, except on soft ores, are causing them to be used less and less. Both large Blakes and gyratories take a steam-shovel feed and break to from 3 to 5 in., and it has been the general practice to follow these large breakers with secondary Blakes or gyratories or large rolls, such as 72-in. diameter, which are largely used at the porphyry-copper mills. For this work of secondary breaking to approximately 1½ in., the Symons disk crusher is now being largely used, and has been adopted by the larger mining companies such as Phelps, Dodge & Co., the Guggenheim companies, the Anaconda Copper Co., and the Inspiration Copper Co. Records of the Detroit Copper Co. of Phelps, Dodge & Co., at Morenci, Ariz., give a life of 170,000 tons for one set of manganese-steel disks, which are the main wearing parts, and cost about $300. The Federal Lead Co., at Flat River, Mo., obtained the low figure of 0.2c. per ton for wear over a period of a year.

An interesting test of capacity, power and size of the product of a 48-in. disk crusher was made by David Gilmour, chief engineer for the Guggenheim Exploration Co., with a view to determining the advisability of using it instead of 72x20-in. rolls, and as a result the disk crusher

was adopted for the Chile Copper Co., at Chuquicamata, Chile. One of the tests was as shown herewith:

TEST OF DISK CRUSHER

Feed, 20% 4 to 6 in., 50% 2 to 4 in., 25% 1 to 1½ in.
Crusher opening, 1¼ in.
Product, 78% ½ to 1½ in., 22% ½ in. and smaller.
Capacity, 100 tons per hr.
Power, 29 to 47.9 hp.

It will be noted that the rated capacity for this crusher with 1½-in. product is 60 to 80 tons; the power from 50 to 65 hp., so that the catalog ratings are conservative.

In a more practical way the advantages of the disk crusher can be shown by a comparison of costs, which are available for 1000-ton units for secondary breaking from 3½ into 1½ in. The accompanying estimate is based on the cost of power and repairs only, with 8 hr. crushing and power taken at the low figure of $50 per hp. per year, the average yearly tonnage being 350,000 tons. The estimate is given for both class A and class B ores, and comparison is made between gyratories, rolls and disk breakers.

CRUSHER ACTION ON VARIOUS ORES—CLASS A

	Two No. 5 Gyratories 50 Hp. (25 Hp. Each)	72x16-in. Rolls 60 Hp.	48-in. Disk 40 Hp.
Power	0.24c.	0.29c.	0.2c.
Repairs	0.65c.	0.50c.	0.2c.
Total	0.89c.	0.79c.	0.4c.

CLASS B

	Two No. 6 Gyratories 66 Hp. (33 Hp. Each)	72x20-in. Rolls 80 Hp.	48-in. Disk 50 Hp.
Power	0.32c.	0.39c.	0.25c.
Repairs	1.30c.	1.00c.	0.40c.
Total	1.62c.	1.39c.	0.65c.

The use of the disk crusher for secondary breaking enables an approximate saving in power and repairs alone of from ⅓ to 1c., depending on the resistance of the ore and the machinery used. It also offers other advantages such as low first cost, low transportation charges, less foundation and space occupied, also higher operating factor and less attention. As to first cost, the 48-in. disk crusher sells for $3500 f.o.b. works, and weighs 40,000 lb.; two No. 5 gyratories sell for approximately $3000 and weigh 62,000 lb.; and the 72x16-in. rolls sell for approximately $6000 and weigh 180,000 pounds.

Crushing from 1½ In. to Pebble-Mill Feed

By preparing ores for grinding is meant taking the average product of breaking, or 1½ in., and crushing it to a size suitable for pebble-mill feed, the size being determined by the process of recovery to be used. This crushing stage would be between 1½-in. feed and 10-mesh product for flotation or cyaniding, to 4-mesh product for table concentration, and to ⅜-in. where a jig feed is required.

The crushing machinery used for the cyaniding of gold and silver ores has been usually stamps, while for the flotation of sulphide ores, rolls are generally employed. The tendency, however, of machinery for this work is more and more toward ball mills, especially on class A ores, the reason being low cost of operation, less foundation space occupied, and erection charges, also less attention and no noise. Where tougher ores are encountered, as at Pearce and Kingman, Ariz., ball mills have been discarded, although at Pearce they have been again installed after stamps. No ball mill on such ores could economically take the place of stamps alone on account of the high iron consumption and the small output obtained for the power used. On gold ores such as at Porcupine, where they have been introduced, or on porphyry copper ores, such as at the Utah Copper or at the Inspiration Copper, where they have been tested, the ball mill should be preferred. In such cases the iron consumption should not be greater than ¾ lb. per ton of ore ground, including balls and linings. The balls used are of forged steel and cost approximately 5c. per lb. and the linings are of manganese or other steel.

The use of ball mills is not new, and various types have previously been used, the Krupp type being the best known. Richards' "Ore Dressing" reports ball consumption of 0.55 lb. on gold ores in Australia with a feed of from 6 to 2 in., and as high as 1.7 lb. on 4½% chalcopyrite ore in Chile. The Krupp type of mill has a limited screen area; hence the flow of ore through the mill is hindered and the capacity low. It is due to the more recent designs of ball mills of cylindrical shape, having free flow and a quick discharge that such strikingly improved results are being obtained.

The ball mill experimented with at the plant of the Utah Copper Co., and more recently at the test mill of the Inspiration Copper Co., is practically a dry tube mill such as has been used in cement practice, but used for wet crushing. It is a tube with less length than its diameter and is fitted with discharge lifters, and uses steel balls instead of flint pebbles. The feed is through a scoop feeder, which has a large enough opening so that balls may be fed through it. The discharge end of the mill is fitted with a grid or perforated diaphragm plate securely bolted together. The center of the plate is a center-discharge cone casting and the whole is held to the discharge head of the mill by means of fixed radial ribs extending from the cone to the periphery of the mill and serving as lifters, picking up the material which has passed the diaphragm plate and discharging it through the trunnion. The object of the perforated diaphragm plate is to allow all material to pass quickly through the end of the mill, while the lifters create a circulation and discharge, and eliminate the restricted flow through the mill, such as is the case with the center overflow discharge. Oversize is screened and returned to the mill. In this ball mill it is intended to keep a low pulp-load line, and dependence is put upon the lifters to do this. It is also claimed that this low pulp line increases the efficiency of the mill by avoiding the retarding effect of the balls acting upon a thick pulpy mass, which would be the case if the pulp load were carried on the center line. The ball mill will take a coarse feed; a 4-ft. mill will take a 3-in. feed, but for best results about 1½-in. average is considered good practice. The mill will also deliver a fine product, but at a sacrifice of capacity. In crushing to 10 mesh with a feed of 1½ in., approximately 50% will pass 60 mesh, the usual flotation product required, while about 25% will pass 200 mesh, so that its use eliminates a large number of pebble mills for finishing. At the Utah Copper Co. the ball tube mill, 4 ft. in diameter by 26 in. long inside the plate, crushes from a 3-in. to ¼-in. feed down to a 30-mesh product at the rate of 36 tons per 24 hr., using 13 hp. Of this product, 72% passed 60 mesh and 30% passed 200 mesh. This same mill ground 20 tons through 40 mesh for 11¼ hp. Of the product, 90% went through 60 mesh and 40% through 200 mesh. If it is assumed that equal amounts of energy are absorbed in crushing, this mill when crushing to 10 mesh should have a capacity of 75 tons with not to exceed 13 hp. At the Utah Copper Co. there was also a test on an 8x5-ft. ball mill crushing 1-in. feed through 10 mesh, with a capacity of

850 tons per day of 24 hr., for 130 hp. Of the product, 45% passed 60 mesh and 22% passed 200 mesh.

From this data I would rate the average duty of ball mills with 1½-in. feed and 10-mesh product as per the following table. With softer or tougher ores the capacities would be increased or decreased accordingly.

DUTY OF BALL MILLS

Size of Mill		Tonnage	
Diam.	Length	24 Hr.	Horsepower
4 ft.	2 ft. 2 in.	75	13
5 ft.	3 ft. 4 in.	200	30
6 ft.	4 ft. 6 in.	400	60
7 ft.	4 ft. 6 in.	600	90
8 ft.	5 ft.	850	130

Regarding operating costs, an estimated comparison between ball mills and stamps should be of interest.

In gold milling using stamps of 1050- to 1200-lb. weight on ordinary ores with a 3-mesh screen an average duty of 10 tons per stamp is obtained and for a 1000-ton unit a battery of 100 stamps would be necessary, to be followed by 10 tube mills approximately 5x20-ft. If a 10-mesh screen were used, there would be required a battery of approximately 150 stamps and five tube mills. The stamps would take an average 2.4 hp. per stamp or 360 hp. to crush 1000 tons to 10-mesh. Referring to the table above, it will be noticed that two 7x4-ft. 6-in. ball mills would conservatively do this work for 180 hp. With power at $50 per hp. per year, on a basis of 350,000 tons, a saving in power alone of 2½c. per ton is possible. At the Utah Copper Co. there was a ball consumption of about ⅝ lb. per ton milled and this with lining consumption would make a total of ¾ lb. Taken at an average of 6c. per lb. this would give a total of 4c. per ton for wear and tear. A figure of 4c. is the lowest possible which can be assumed for stamps, based on Alaska Mexican and Treadwell figures. The labor costs for ball mills would also be considerably lower, at least 3c. per ton. A fair comparison would be as follows:

COMPARISON OF STAMPS AND BALL MILLS

Type	Power	Repairs	Labor	Total
Stamps	5c.	4c.	4c.	13c.
Ball Mill	2½c.	4c.	1½c.	7c.

A saving of at least 6c. per ton in operating costs is possible on a 1000-ton basis. As for first cost, 150 stamps would cost about $35,000 at the factory, while the two ball mills would not exceed $6000. Not only is there the advantage in first cost and operation, but also in freight, foundation, erection and buildings. My opinion is that only where the iron consumption for ball mills is over 2 lb., or 12c. a ton, could stamps be considered.

As soon as the results of the tests at the Inspiration Copper Co.'s mill are available, a fair comparison can be made between their ball mill and the rolls at the neighboring Miami mill. It is doubtful if rolls can equal 7c. on a 1000-ton basis, reducing from 1½ in. to 10 mesh, and, as in the case of stamps, the ball mill has other advantages, such as first cost, etc. Where jigging is required, crushing is limited to ⅜ in. or ½ in., and for this work either a 18-in. or 24-in. disk crusher is now largely used instead of rolls. Where a smaller product is wanted, such as a 4-mesh for table concentration of carbonate ores, rolls are still being used and nothing has yet been found to take their place.

The size roll for 4-mesh product, which is most generally used in the large copper mills, is the 42x16-in. face and a noted improvement is shown in the design of David Cole at the new mill of the Arizona Copper Co., Morenci, Ariz., whereby he minimizes vibrations and the tendency to shaft-breaking by making a larger bearing area on the movable pedestal, and holding the pedestal against its seat. This latter condition is obtained by connecting the movable pedestal to the stationary or main frame by means of a tension rod, which is a drive-fit at the main frame and a snug-sliding fit in the movable frame, so that the pedestal is prevented from vibrating by the leverage action through the tension rod against the main frame. This roll also has greater spring pressure than is usual, and has at least 50% more capacity with but about 15% increase in weight over the former 42x16-in. rolls, in which the tension rod is loose in both the fixed and movable ends of the roll.

Use of Stamp Batteries

For tough ores it is probable that stamps will continue to be used on account of the high iron consumption of the ball mills on such ores, and it should be noted that on the Rand in South Africa a combination ball and pebble mill "Giesecke" was tested thoroughly against stamps and rejected supposedly on account of the heavy iron consumption. The stamps generally used in America are the 5- and 10-stamp multiple batteries, the stamps being from 1050- to 1400-lb. falling weight. The 2000-lb. Nissen stamp in tests on the Rand has demonstrated that it takes 25% less power and 10% less iron than the older type of the same weight, and this can be attributed to the quickness of discharge of the Nissen due to the circular form of the mortar surrounding the stamp shoe. Nissen stamps are also less costly to install when the foundations and less space occupied are considered. It is well known that in the Lake Superior copper district steam stamps have been used for years and it would seem that here a heavy power-driven gravity stamp could be employed to advantage, as although the same power per stamp would be used for the same falling weight, it should use less fuel per horsepower than the direct steam stamp. In gold and silver milling, as cyaniding is now most generally used, there is no longer the objection to the use of heavy stamps on account of the slimes which would be made, and coarse screens are now used, as the finishing is done in pebble mills.

Tube Mills for Fine Grinding

Tube mills have been used for years in wet grinding of ores for making slimes. The mill which has been most generally used is known as the overflow type, the circulation through which depends on the amount of feed, and the discharge on the amount of slimes which are displaced, come to the surface of the pulp, and floating out at the center through a grid. There are tube mills of many makes and specification, but there are but two types—the cylindrical, or usual type, and the conical type, exemplified by the Hardinge tube and ball mills. The diameter of the mills used has been mostly from 4 to 5 ft., with a tendency toward 6 ft., and the length from 16 to 22 ft. The feed until recently has been about 10 mesh, but the tendency when using stamps is now toward coarser material; as high as ½ in. is now used at the Dome mines, Porcupine, in 5x22-ft. mills and ¾ in. in 6x20-ft. mills at the Nipissing. The reason is that it has been found that tube mills will handle coarse feeds, and enlarging the stamp battery screens increases tonnage to such an extent that the per-ton costs are lowered. As for length of mill, it has been demonstrated in South Africa that a 16-ft. mill would do the work of a 20- or 22-ft. mill, while at Tonopah, Nev., an 18-ft. mill has been found to do as

much work as a 22-ft. mill, all mills being of the overflow type. This is accounted for by the fact that in the overflow type of mills there is a space at the discharge end of the mill where the material ground fine enough is held in the mill and overground, taking up space which is not efficiently utilized. It has also been demonstrated that this extra length of mill can be efficiently utilized if the already ground material could be discharged and the space used for grinding new material. The El Oro Mining & Ry. Co. several years ago made exhaustive tests on various types of discharges and obtained the best results by the use of a perforated diaphragm plate at the discharge end of the mill, about 6 in. from the discharge head on a 5x22-ft. mill. This design allowed a discharge through the entire end of the mill and created a settling or classifying chamber free from pebbles, increasing the capacity of the mills about 33⅓%, and made its mills efficient throughout their entire length. The amount of oversize was increased and was returned to the mill through the classifier, but with a resulting gain of —200 mesh material. These tests also determined that the critical speed of a point on the lining of a tube mill was about 410 ft. per minute.

It has been taken for granted that any tube mill, being designed for sliming, would not be capable of making a coarse or granular product, but this has been shown to be an error by an arrangement which consists of the addition of radial adjustable shutters to the El Oro type of discharge. A 5x14-ft. mill so equipped at the Gold Hunter Mining & Milling Co., Mullan, Idaho, ground 130 tons per day of silver-lead middlings from the jigs. The feed was ⅜ in. and the product 20 mesh designed for table concentration. The —200-mesh material averaged 30%, the horsepower 30, and the pebble consumption 0.9 lb. per ton. All oversize from the mill was returned to it after passing a Callow screen. A trial over a period of a month without the discharge in use and used as an overflow-type mill resulted in a tonnage of 112 tons per day for 33 hp., using 1.2 lb. of pebbles and making 40% of —200 mesh.

It is now recognized that the tube mill may grind coarse as well as fine and make either a granular or colloidal product, depending on the type of discharge; that it can handle feeds of size recently considered impracticable, and also that the speed of the mill and the percentage of moisture in the pulp affect the economy to a very great extent.

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Steel in Austria-Hungary

Steel production in Austria-Hungary in 1914 is reported as follows, in metric tons:

	Austria	Hungary	Bosnia	Total
Acid converter	604	4,009	.....	4,613
Basic converter	159,500	.....	.....	159,500
Openhearth	1,312,988	607,361	28,520	1,948,869
Puddled	9,668	188	.....	9,856
Crucible	16,424	1,133	.....	17,557
Electric	18,655	1,189	.....	19,844
Total steel	1,517,839	613,880	28,520	2,160,239
Puddled iron	20,932	9,588	.....	30,520
Totals	1,538,771	623,468	28,520	2,190,759
Totals, 1913	1,840,425	808,538	33,656	2,682,619

The total decrease in 1914, as compared with 1913, was 491,860 tons, or 18.3%. Openhearth steel in 1914 was 89% of the total, basic converter being 7.3%. The proportional decrease was greatest in converter steel. The loss in production was mainly due to the war conditions in the latter part of the year.

Chronology of Mining for March, 1915

Mar. 1—Increase of wages granted by the Quincy Mining Co.—Hoisting of ore resumed at Ashland mine, Gogebic Range.—Mountain Copper Co. resumed operation of its smeltery at Martinez.—Newport mine, Michigan, resumed full-time work.

Mar. 2—Explosion in the Layland mines (No. 3) of the New River & Pocahontas Consolidated Coal Co., near Quinnimont, W. Va., entombing about 160 miners; 47 men subsequently rescued.—Decision rendered in favor of Ontario Mining Co. in its suit against the Stewart Mining Co., of Idaho, for trespass.—Metal-mining property of Golden Cycle Mining Co. sold to Vindicator Consolidated Gold Mining Co. for $1,500,000.

Mar. 3—Persons unknown dynamited and destroyed Green Copper shaft of Anaconda company at Butte.—President Wilson signed Foster bill providing for the establishment and maintenance of 10 mining experiment stations and seven mine-safety stations in addition to those already established.

Mar. 4—Victor and Virgin mines in Mohave County, Ariz., sold to Orion Mining & Milling Co.

Mar. 5—Explosion in copper mines at Cabeza del Buey, 86 miles from Badajos, Spain.

Mar. 9—Judge Van Fleet in U. S. District Court rendered decision that the Mammoth Copper Co.'s plant at Kennett was doing no damage to the agricultural lands. Company has resumed work.—New electric haulage system of Alaska-Juneau mine started.

Mar. 13—Strike among the zinc smelters in Kansas and Oklahoma.

Mar. 16—Full-time operations resumed at the lead mines in St. Francois Co., Missouri.—Mountain Copper Co.'s new concentrator at Keswick, Calif., started.—Cuyuna 1915 shipping season inaugurated.

Mar. 17—Twenty-stamp mill at Plumbago mine, Alleghany, Calif., destroyed by fire.—Compromise effected in strike of workers in Kansas and Oklahoma zinc smelteries.—Fourteen members of the faculty of the Univeristy of Utah resigned.

Mar. 18—Crushing began at new mill of Rochester Mines Co., Nevada.

Mar. 19—Capt. J. R. DeLamar succeeded Ambrose Monell as president of the Dome Mines, Ltd.

Mar. 22—Snowslide at Howe Sound, B. C., swept away several bunkhouses at Britannia Mine; 55 killed and many injured.

Mar. 29—Butte-Alex Scott mine resumed operations.

Mar. 30—Hancock mine, Michigan, resumed operation.—Work resumed at High Ore and Diamond mines of Anaconda company.

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Tasmania Mineral Production in 1914

The mineral production of Tasmania in 1914 is reported by the Department of Mines as follows, the items being arranged in order of descending values: Blister copper, 7509 tons; tin ore, 2573 tons; gold, including gold contained in blister copper and silver-lead bullion, 26,243 oz.; silver-lead ore, 11,566 tons; coal, 60,794; copper and copper ore, 3288 tons; osmiridium, 1019 oz.; wolfram, 47 tons; bismuth, 6 tons; shale, 75 tons.

Details of Practical Mining

Azimuth Estimation from Incorrect Plumbing

By A. E. Flynn*

It often happens that in plumbing a shaft an error in either angular or linear measurements disqualifies the whole plumbing. However, when the triangulation method is used a careful consideration of the results in the office may locate and eliminate a single error, and thus avoid another plumbing, which possibly may be inconvenient at the time.

The location of an error in the triangle obtained from two plumb lines depends on the fact that four dimensions of the triangle are taken—one angle and three sides—while only three dimensions are required to solve the triangle. The fourth dimension is usually taken in order to check the accuracy of the work; but in case of an error the four dimensions are valuable for locating and eliminating the error, although this is not realized by the average surveyor.

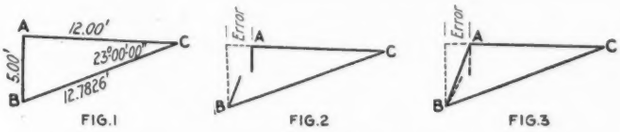


FIG.1 FIG.2 FIG.3

Triangulation for Shaft Plumbing Errors

There are three fundamental formulas used for the solution of such a triangle:

(1) $\sin A = a\frac{\sin C}{c}$

(2) $\tan \frac{1}{2}(A - B) = \tan \frac{1}{2}(A + B) \times \frac{a - b}{a + b}$

(3) $\sin \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{bc}}$

Each formula employs only three of the four known dimensions and each one neglects a different dimension. Formula 1 does not involve one side, either a or b; formula 2 does not involve the base; formula 3 does not involve the measured angle.

It will be seen that if the location of the error is known, by choosing the right formula correct results will be obtained.

However, it seldom happens that the location of the error is known, and one must consider the most probable location according to the conditions in each particular case. Generally speaking, it may be stated that there is more likelihood of error in the linear measurements than in the angular measurements, because the former necessitate the coöperation of an assistant, who is not so reliable as the surveyor, and this more than doubles the chance of error. In the case of the base, the measurement at the other level gives a reliable check, which is confirmed in the office if the other triangle gives an accurate solution. Error is most likely to occur in the dimensions as follows, arranged in the order of probability: The sides, the angle, the base.

If there is an error in the triangle it will be shown by the fact that, after calculating the angles A and B by formula 1, the three angles do not add up to 180°. If now the triangle is solved by formula 2, new values for the angles A and B will be found, the three angles adding up to 180° by the nature of the formula. If there has been an error in the measurement of one side, then the value of one of the angles will be approximately the same by both formulas and the side opposite this angle is the one in error. This may seem paradoxical at first, but the following considerations will show the reason for it:

Fig. 1 shows a typical triangle with dimensions: a, 12.7826 ft.; b, 12.00 ft.; c, 5.00 ft.; C, 23° 00′ 00″.

Suppose the side b to be 11.98 ft. long, an error of —0.02 ft. Calculations by formulas 1 and 2 are shown in the following table and the conditions are represented by Figs. 2 and 3 respectively.

		Error of —0.02 Ft. in the Side b			
Triangle Correct	Formula 1	d_1	Formula 2	d_2
Angle A..87° 19′ 20″	87° 19′ 20″	0′ 00″	87° 33′ 06″	+13′ 46″
Angle B..69° 40′ 40″	69° 25′ 18″	—15′ 22″	69° 26′ 54″	—13′ 46″

The differences between the incorrect and the correct values of angle A and B are shown under d_1 and d_2. From the table and the figures shown it will be seen that the values of the angle B as found by formulas 1 and 2 are approximately the same, B being the angle opposite the side in error.

In the event of both sides or the angle C being in error, there would be approximately an equal difference between the values of the angles A and B as found by both formulas.

*Mining engineer, Nipissing Mining Co., Cobalt, Ont

Pulling Stuck Drills

A scheme for pulling drills stuck in drill-holes has been patented by Howison Crouch, of Grass Valley (U. S. pat. 1,117,554). This device consists of a short piece of drill steel to go in the chuck of a stoper, the end of the steel being turned up a couple of inches and flattened out, with a punched hole to take the link of a short chain. At the other end of the chain is an ordinary drill-pulling clamp, a piece of flat metal with a hole through it corresponding to the drill steel section so it will slip over the stuck drill and when pulled by the chain will tilt and bite the drill firmly. The point of the stoper is set against the face of the drift or breast just under the stuck drill and held parallel to it. The clamp is slipped over the latter, and the short bent piece put in the chuck. Air is turned on the stoper and the rigging comes taut. Then the valve is opened until the stoper starts hammering. This accomplishes the desired result. Swinging a sledge to do this is often not possible because of the limited space at the breast, and besides this

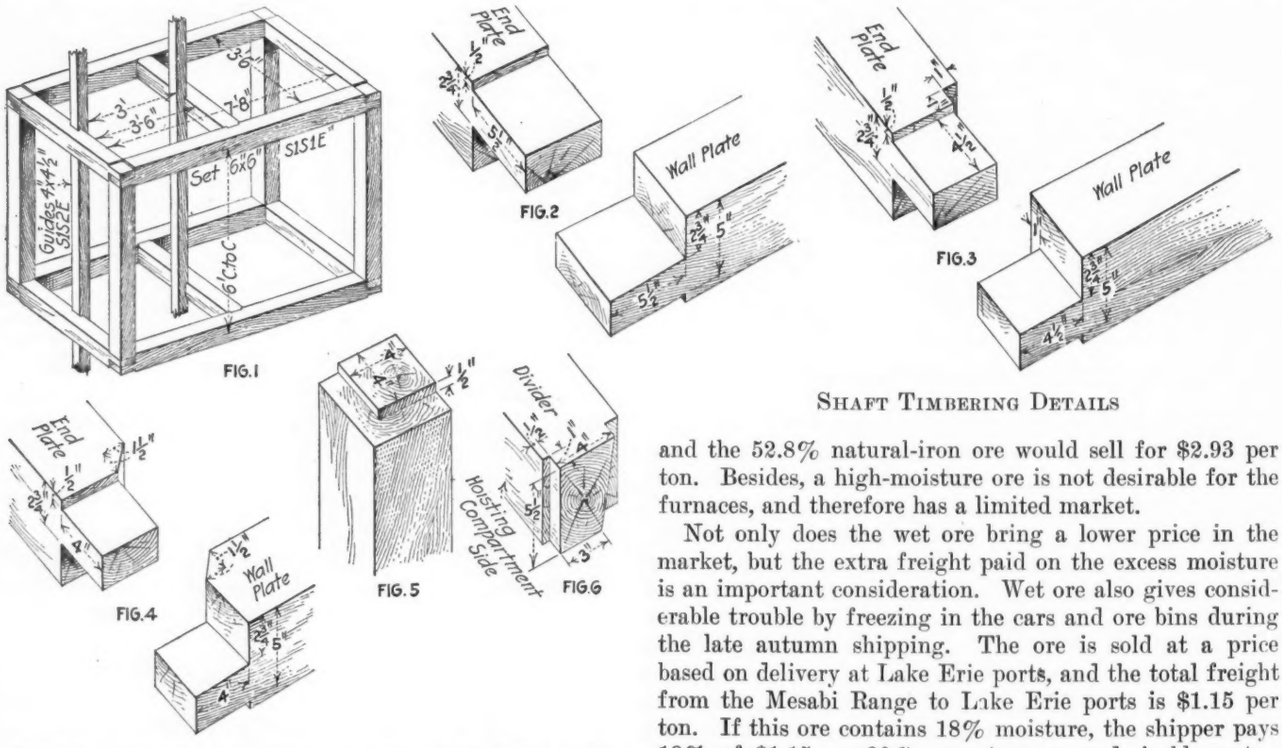
method is a consumer of elbow grease, which is not always wholly popular with the exasperated machine man.

Light Shaft Timbering

By Harold A. Linke*

A convenient size for a vertical, two-compartment, exploratory shaft is 3 ft. 6 in. by 7 ft. 8 in. inside timbers. The excavation for a shaft of this size measures about 5x9 ft., is of minimum cross-section for convenience and still large enough to permit drilling to sufficient depth for economical work.

The problem of timbering a shaft is governed by local conditions. In case the ground is not heavy and stands well, where only occasional lagging is required and where the shaft sets serve mainly as support for the guides, ladders, pipe, etc., the sets shown in Fig. 1 answer every purpose. The joint is detailed in Fig. 2. The ends of



Shaft Timbering Details

the posts for this set require no special framing, other than squaring.

If, however, all available strength of set timbers is required, then it is advisable to frame either as shown in Fig. 3 or in Fig. 4. The end of a post for a set framed in this manner is detailed in Fig. 5. Fig. 6 shows the details of a divider.

When lumber is to be transported by rail for any considerable distance it will be found that the laid-down price of, say, 6x6-in., S1S1E is much lower than 6x6-in. rough; that is to say, the saving in transportation on weight removed in surfacing more than compensates for the cost of dressing. The details of Figs. 2 to 6 are dimensioned for 6x6-in. S1S1E, which usually measures 5½ to 5⅝ in. square.

Pure Electrolytic Iron Forms an Effective Protective Coating for Steel, according to S. Cowper Coles, inventor of the process of Sherardizing, chemically pure iron being practically rustless.

*Mining engineer, 401 Sixth St., Calumet, Mich.

Drying Iron Ore on the Mesabi Range*

Many iron-ore deposits on the Mesabi iron range contain so much moisture in their natural condition that the ore is noncommercial. In some of them this moisture amounts to 20%. A porous ore contains more water than a dense ore, and ore from water-soaked ground more than ore from dry ground.

Before assaying, the ore is dried at 212° F. Therefore an ore containing 18% moisture and assaying 57.4% iron when dried would contain (100 — 18) × 57.4%, or 47.1% iron natural, which is the basis on which the ore is purchased by the furnace man. If the moisture in this should be reduced from 18% to 8%, the ore would then contain (100 — 8) × 57.4%, or 52.8% natural iron. On the basis of 1914 prices for Mesabi nonbessemer ore, the 47.1% natural iron ore would sell for $2.40 per ton and the 52.8% natural-iron ore would sell for $2.93 per ton. Besides, a high-moisture ore is not desirable for the furnaces, and therefore has a limited market.

Not only does the wet ore bring a lower price in the market, but the extra freight paid on the excess moisture is an important consideration. Wet ore also gives considerable trouble by freezing in the cars and ore bins during the late autumn shipping. The ore is sold at a price based on delivery at Lake Erie ports, and the total freight from the Mesabi Range to Lake Erie ports is $1.15 per ton. If this ore contains 18% moisture, the shipper pays 18% of $1.15, or 20.7c. per ton, on undesirable water, for which he is penalized by the furnace man. Hence, the moisture in the ore scores against the profits on every count.

Two drying plants for eliminating some of the moisture from certain ores are now in operation on the Mesabi range. One of these is at the Brunt mine near Mountain Iron and was built by the M. A. Hanna Co.; the other is at the Whiteside mine near Buhl and was built by the Shenango Furnace Co. The ore from these two mines differs in physical character, so that slightly different treatment is required, but the principle involved in the drying is the same in the two plants. Both plants dry the ore by passing it through cylindrical rotary driers charged with hot gases from attached coal furnaces. A suction fan induces a strong draft through the drier and draws off the water vapor driven from the ore. The Brunt ore

*An abstract of an article by Edwin J. Collins, mining engineer, Duluth, Minn., appearing in the Michigan College of Mines "Alumnus," October, 1914.

contains lumps that must be crushed before drying. Also, owing to the physical character of the ore, considerable dust is drawn off with the moisture, so that each drier has a dust chamber attached. The Whiteside ore is dried without crushing, and it gives off practically no dust with the moisture, so that no dust collectors are needed.

The Brunt plant contains two Ruggles-Coles driers, 90 in. in diameter and 55 ft. long, and two Economy driers, 84 in. in diameter and 55 ft. long. These differ in heating and furnace arrangement from the Ruggles-Coles driers. The Whiteside drying plant contains four Ruggles-Coles driers, 108 in. in diameter and 57 ft. long.

The operation of the rotary driers for drying iron ore is practically the same as for drying other materials. Of course, the cylinder and all parts of the driving mechanism must be much stronger than for a drier operating on lighter materials. The cylinder is inclined at a slight angle from the horizontal to assist the advance of the ore. On the inside periphery of the cylinder are a number of equally spaced flanged angles running longitudinally. As the drier rotates, these flanges elevate the ore nearly to the top of the cylinder, till the inclination of the angles becomes too great to retain it, when it drops through the hot gases to the bottom of the drier. The ore is thus elevated and dropped again and again, but each time, owing to the inclination of the drier, a little in advance of the position from which it began to rise. In passing through a 55-ft. drier the ore travels about 900 ft. in the hot gases.

The rate of evaporation of the moisture increases with the temperature of the gases and with an increase in the free surface of the ore in contact with the gases; it is further accelerated by the continued changing of the hot gases and the diminution of pressure caused by the suction fan. The amount of moisture removed per ton of ore is a direct function of the volume and the temperature of the hot gases available and the length of time the ore remains in the drier. The temperature, consequently volume, of the hot gases for drying the ore is a function of the amount of fuel consumed in a unit time and the efficiency of the furnace and drier. The length of time the ore remains in the drier depends directly on the rapidity of rotation of the drier and its inclination to the horizontal, because the faster the cylinder rotates and the steeper its inclination, the faster the ore will travel toward the lower end.

The amount of moisture in the dried product can thus be kept at any point desired, and the amount of moisture removed from the ore will be in inverse ratio to the tonnage put through the drier in a unit time. In drying the ore the moisture is not reduced below 7½%, because if it is, the ore has a tendency to break into fine particles not so desirable for the blast furnaces as the larger lumps.

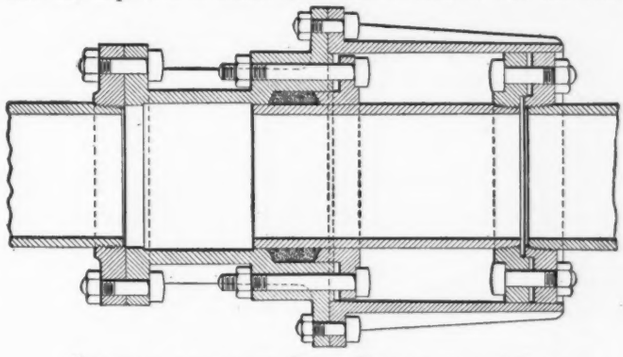
At 1914 prices, wet ore containing 47.1% natural iron would be worth $2.40 per ton and dry ore containing 52.8% natural iron would be worth $2.93 per ton. Therefore the saving effected by drying the ore from 18% to 8% moisture would be as follows:

1 ton wet ore at	$2.40 =	$2.40
1 ton freight at	1.15 =	1.15
		$1.25 net
0.9 ton dry ore at	$2.93 =	$2.64
0.9 ton freight at	1.15 =	1.04
		$1.60 net

The increase in the value of the ore, drying it from 18% to 8% moisture, would therefore be 35c. per ton. The net profit would depend upon the cost of drying the ore, which may vary from 20 to 30c. per ton. The dry ore has the advantage of a ready market at times when the wet ore is unsalable. The drying plants are operated only during the shipping season, about six or seven months per year.

Ross Expansion Joint

The illustration shows an expansion joint, the primary feature of which is keeping the pipe line in alignment, thus preventing the ordinary wear and tear on packing experienced in slip-tube expansion joints. If it were not for the outer sleeve, this device would be nothing more than an ordinary slip-joint. The packing space is ample and the slip-tube is made of bronze so that it will not rust



SECTION THROUGH ROSS EXPANSION JOINT

in the packing. This type of joint is made for pressure up to 200 lb. per sq.in., in all sizes to and including 24 in. Each size will accommodate 4 in. of travel for expansion and contraction. This joint is manufactured by the Alberger Heater Co., of Buffalo, New York.

Powder Magazines

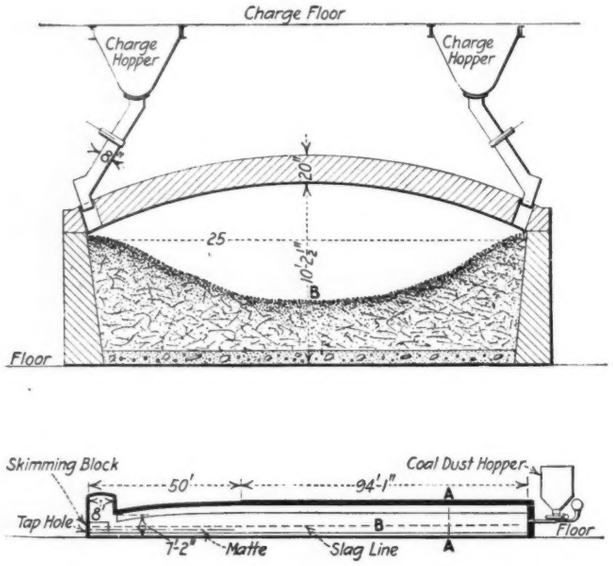
A dugout in the side of a hill is often considered a good place in which to store explosives. This, however, is a mistake, and such a magazine is ultimately an expensive one, because the efficiency of the explosive, on account of its moisture-absorbing properties, falls off very rapidly when stored underground for any length of time. Powder magazines should be constructed, and a good material is brick. Stone or concrete or similar materials—which in the event of an explosion would be converted into projectiles, which would do damage to surrounding property—should not be used. Brick is pulverized into dust by a dynamite explosion and does no harm. Powder magazines should have bullet-proof doors, and where this is not feasible the doorways should be protected by a screen or barricade. It is advisable to surround the entire magazine with a similar barricade. It requires 11 in. of sand to stop a bullet fired at ordinary range from a modern high-power rifle using smokeless powder, such as is commonly used now by hunters.

As has often been suggested before, to sink the entire building behind a heavy earthen parapet is the safest method. Then anything which can be converted into a projectile by an explosion must travel with a high trajectory in order to do any damage, which is much safer for the surroundings than being in point-blank range.

Details of Milling and Smelting

New Coal-Dust-Fired Furnace at Anaconda

The No. 5 reverberatory furnace at Anaconda, which has been doing such good work with pulverized coal as fuel, was remodeled in accordance with the experience gained by the operation of the No. 8 reverberatory with coal-dust fuel. The No. 5 furnace, which is shown in the accompanying drawings, attained during its first



SECTION THROUGH ANACONDA COAL-DUST-FIRED REVERBERATORY

week of operation a fuel ratio ranging from 7.1 to 7.9. Louis V. Bender gives[1] the dimensions of this furnace as follows: Interior, 144 ft. long by 25 ft. wide; height at firing end, 9 ft. 3½ in.; height at skimming end, 6 ft. 6 in.; flue area, 48 sq.ft. The skimming plate is 24 in. above the matte tap hole, which is at the skimming end of the furnace instead of at the side, as formerly, the method of charging forcing the matte to the skimming end of the furnace. The hoppers for charging the calcines and fettling material extend on both sides of the furnace for its entire length, and 8-in. charge pipes are used instead of the 6-in. pipes installed on the No. 8 reverberatory.

The machinery for preparing and delivering the coal to the No. 5 furnace is of the same type as that used for the No. 8 furnace. In October, 1914, the coal used in the No. 8 furnace was pulverized so that 92.5% passed 100 mesh and 71.4% passed 200 mesh. This is not so fine as formerly, but no difference was noticed in the work of the furnace.

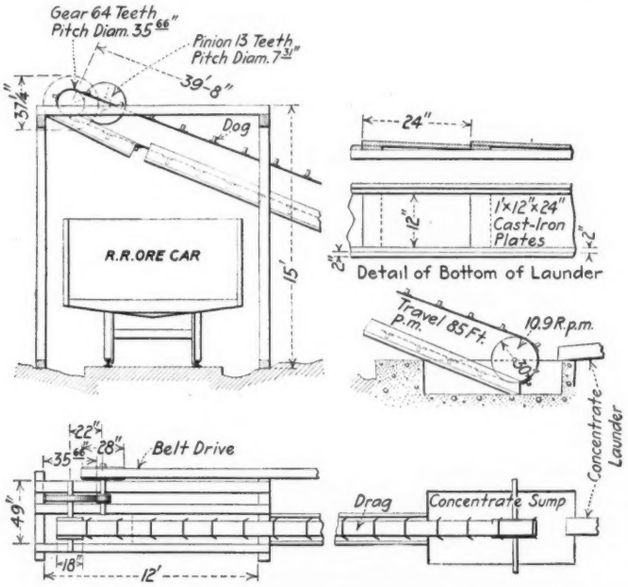
Heating the Solution for Leaching at Anaconda is to be done by passing the lixiviant through the ore coolers (U. S. pat. 1,115,689, granted to Frederick Laist) in the opposite direction to that taken by the ore which is being cooled.

[1]"Bull. of A. I. M. E.," January, 1915.

Handling Concentrates at the South Utah Plant

BY THOMAS H. TULLOCH*

The system of loading concentrates here described was installed more than two years ago at the concentrator of the South Utah Mines & Smelters, Newhouse, Utah. This concentrator has a capacity of from 800 to 1000 tons per day, and the ore treated has a ratio of concentration varying from 9 to 15 into 1. The average production of concentrates is about 75 tons per 24 hr. The concentrates from the different groups of jigs, tables and vanners flow by gravity to a main trunk launder, which delivers them to a sump at the lower end of the mill near



CONCENTRATE-LOADING ARRANGEMENT AT THE SOUTH UTAH PLANT

the railroad tracks. The concentrates are then dewatered and loaded into standard coal cars by an inclined drag.

The details of the drag are shown in the accompanying drawing. The travel of the scrapers is 85 ft. per min., and they are made of 3x¼-in. iron bent as shown and riveted to pieces of 3x3x¼-in. angle iron. The angle is fastened to the belt with elevator bolts, a piece of old belting being placed between the angle and the belt. When the straps are worn down to the angles, they are turned over and used again. An extra set of scrapers is kept on hand to shorten time in making change. The launder is lined with 1x12x24-in. cast-iron plates. A narrow strip of belting is placed under the upper end of each plate to keep the scrapers from catching on the plates when new. The last plate has its upper end slightly elevated above the normal line of travel of the scrapers, and as the scrapers drop from this last plate the jar liberates all concentrates

*Superintendent of concentrator, South Utah Mines & Smelters, Newhouse, Utah.

sticking to them. The belt used is a 10-in., six-ply Lanco balata. This belt has been in use about 10 months and shows little wear. Other types used lasted from four to 10 months.

The overflow from the drag sump is elevated by a 3-in. centrifugal pump to a hydraulic pocket classifier, the spigot products of which are treated on Wilfley tables and the overflow in eight 8-ft. Callow tanks. The overflow of the tanks is returned to the mill-water system and the pulp is treated on Wilfley tables. The concentrates from the tables are conveyed in a launder to a two-compartment bin beside the railroad tracks, from which they are shoveled into the cars. One man working four hours a day keeps the bins empty. The table middlings are returned to the sump, the tailings are rejected and the headwater returned to the mill-water system.

The concentrates delivered into the cars by the drag contain about 17% moisture. Part of this drains out, leaving about 7% moisture in the concentrate shipped. A loading system replaced a hand-tramming method requiring the services of 12 men per 24 hr., and has simplified the water system and reduced the fine sands and slimes in the concentrates. The accompanying tables of

SCREEN TEST OF CONCENTRATE-LOADER PRODUCT

	Per Cent. by Weight	Cumulative Per Cent. by Weight
On 10 mesh	6.50	6.50
On 20 mesh	11.50	18.00
On 30 mesh	21.00	39.00
On 40 mesh	7.00	46.00
On 50 mesh	5.00	51.00
On 60 mesh	14.00	65.00
On 80 mesh	9.50	74.50
On 100 mesh	7.00	81.50
On 120 mesh	9.00	90.50
On 150 mesh	5.00	95.50
On 200 mesh	2.00	97.50
Through 200 mesh	2.50	100.00

SCREEN TEST OF OVERFLOW OF CONCENTRATE LOADER

	Per Cent. by Weight	Cumulative Per Cent. by Weight
On 60 mesh	0.00	0.00
On 80 mesh	7.41	7.41
On 100 mesh	9.00	16.41
On 120 mesh	9.52	25.93
On 150 mesh	22.22	48.15
On 200 mesh	22.22	70.37
Through 200 mesh	29.63	100.00

screen tests show the character of the drag product and the overflow from the sump.

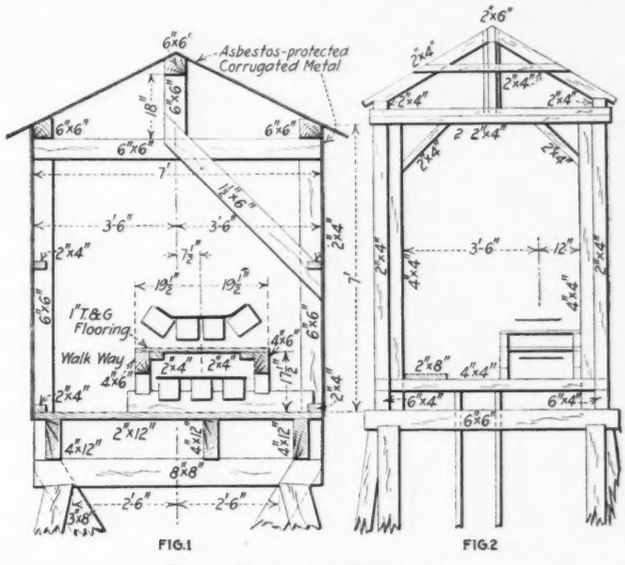
The railroad cars are loaded with about 50 tons of concentrates, a pile of about 25 tons being placed in each end of the car. These piles are leveled off and nine samples are taken from each pile with a hand auger. The cars loaded are all of the same type, and a template is used to determine the points at which to take the sample. The samples are taken in rows of three and are so spaced that each sample represents its proportionate volume and weight of concentrates. The samples are combined, mixed and cut for the final sample. The auger is made of 1x¼-in. strap iron. In taking the sample the auger is first twisted to the bottom of the pile and then a close-fitting piece of boiler tubing is pushed down around it. The tubing with auger and sample inclosed is then removed and the sample dumped into a bucket by drawing off the tubing.

The samples taken in this manner have shown a difference of less than 1% over long periods, from the results obtained at the smelting plant, where sampling is done by tenth-shovel and quartering methods.

The Reduction of Cobalt Arsenide by a mixture of powdered calcium oxide and calcium carbide, or other similar carbide, is patented by Colin G. Fink, of Schenectady (U. S. pat. 1,119,588).

Inclined-Conveyor Housing

Like everything else, there is a right way and a wrong way to build housings for inclined-belt conveyors. This applies particularly to the roof arrangement. If little trusses or rafters are used, the question immediately arises whether to put the posts vertical, and give the rafters their natural support, or to put the posts perpendicular to the floor of the housing—which is the normal and best construction—and contend with the difficulties of supporting and bracing the rafters. These questions are eliminated by a construction as shown in Fig. 1. The posts are set perpendicular to the plane of the conveyor, which is the normal procedure, and plates are run longitudinally on these as in the other case, only



BELT-CONVEYOR HOUSINGS

in this instance no framing or dapping is necessary. The ridge pole is supported by a short jack-post and the corrugated covering spans from the ridge to the plates. This type of construction saves both timber and labor. Fig. 2 shows the way not to do it.

Care of Zinc Boxes

Dressing of zinc boxes should be timed by the appearance of the first compartment, and should not entirely depend on the question of the efficiency of precipitation, says the *Australian Mining Standard*. The maximum action of the solution on the zinc occurs at first contact, and it is therefore essential that there be no channeling in the first compartment. As soon as this is noticeable the box should be dressed. The moving and rearrangement of the zinc frees it from much of the adhering gold or silver slimes; and the repacking of the box so that the solution comes first into contact with the shortest zinc insures the handling of the minimum amount of base metal for the maximum amount of bullion when cleaning up. The use of large zinc boxes with the exposure of an abnormal amount of zinc, which permits the breaking up of some of the zinc in each compartment, is however, a method often adopted. In this case the boxes may be left for a considerable time without attention, but the gold is ultimately found distributed over a large area of zinc, and is not concentrated on the "shorts" in the first compartment, as it is when sufficient attention is paid to dressing.

The Assayer and Chemist

Determination of Platinum, Palladium and Gold

By A. M. Smoot*

Scorify the lead buttons from two or more ½-a.t. crucible fusions together, adding at least six times as much silver as the combined weight of the Pt, Pd and Au present, and cupel *hot*. In rich materials such as slimes or concentrates, two ½-a.t. fusions suffice, but low-grade ores may require 10 or more ½-a.t. fusions combined for each determination.

Part the silver beads with HNO_3 (1:6), followed by stronger parting acid (1:1) and wash with water as usual. All Pd goes into solution, together with considerable Pt. The residue consists of Au plus some Pt. Dissolve residue in strong *aqua regia* and reserve the solution (solution *A*). Precipitate the silver in the nitric-acid solution—containing Ag, Pd and some Pt—with HCl. Practically all the Pt will remain in solution; but the precipitated AgCl is pink in color and contains considerable Pd. Filter off the AgCl, scorify and cupel it and part again with HNO_3 (1:6); all should dissolve. Re-precipitate the Ag with HCl. The liquid now contains most of the remaining Pd, but some is co-precipitated with AgCl. Filter off the AgCl and add the filtrate to the first filtrate from AgCl. Again scorify and cupel the silver chloride, dissolving the silver in nitric acid as before and re-precipitating the silver as chloride. In most cases the filtrate from this silver chloride contains all the remaining Pd. If, however, the AgCl is distinctly pink, another separation must be made.

Unite all filtrates from AgCl precipitations and evaporate to small bulk, adding the *aqua-regia* solution of the Au and Pt (solution *A*). The liquid now contains all the Au, Pt and Pd present in the original ore, together with traces of Ag due to solubility in AgCl in excess of HCl, and also traces of Pb gathered from the lead retained in the silver buttons from the several re-cupellations.

Evaporate the liquid to dryness on the steam bath; take up with dilute HCl (1:3) and evaporate again to dryness; take up with five drops of HCl and 40 c.c. H_2O. Pay no attention to any insoluble residue of AgCl or $PbCl_2$.[1] Precipitate gold by adding, say, 3 gm. of oxalic acid to the solution and boiling it. Let stand over night and filter off the Au. If Pt and Pd are high, it is necessary to re-dissolve the Au in *aqua regia,* evaporating with HCl to dryness and repeating the oxalic-acid precipitation, uniting the filtrate with that from the first gold precipitation. Burn the filter containing the gold and scorify it with six times its weight of silver and a little test lead; cupel, part and weigh the gold as usual.

To the oxalic-acid filtrates from Au add 5 c.c. of HCl and make volume up to 150 c.c.; heat to boiling and precipitate Pt and Pd with a rapid current of H_2S in *hot* solution, passing the current of gas for some time and keeping the solution hot during precipitation. Filter and wash the Pt and Pd sulphides with H_2S water containing a little HCl. Wash the precipitate from the filter with a fine water jet into an original beaker; spread the filter paper (which will contain a small amount of precipitate impossible to wash off) with the precipitate side down over the lower side of a watch-glass cover. Add *aqua regia* to the precipitate in the beaker and place the cover on the beaker; warm gently to dissolve the Pt and Pd sulphides. The fumes arising from the acid dissolve the traces of Pt and Pd adhering to the filter paper. When solution is complete and the filter paper is white, remove the watch-glass cover and wash the paper with hot dilute HCl thrown against it in a fine stream.

Evaporate the *aqua-regia* solution to dryness, take up the residue with HCl and evaporate again to dryness to remove all HNO_3. Take up the residue with two or three drops of HCl and about 2 c.c. of H_2O. The solution is usually perfectly clear, but it may be slightly cloudy owing to the presence of a little AgCl in it. No attention need be paid to this, however. Add 5 to 10 c.c. of a saturated solution of NH_4Cl, stir well and allow to stand over night. Platinum is precipitated as ammonium-platinum chloride—$(NH_4)_2PtCl_6$. Filter and wash the precipitate with 20% NH_4Cl solution. All Pd passes into the filtrate which is reserved (solution *B*). Dissolve the Pt precipitate in boiling hot 5% H_2SO_4; heat the liquid to actual boiling and precipitate with H_2S as before, filtering and washing with H_2S water. Burn the filter and precipitate at a low temperature in a scorifier; add six times as much Ag as Pt, scorifying with lead, cupel and part the silver bead containing the platinum with H_2SO_4; decant off the silver solution and wash once with strong H_2SO_4, followed by 50% H_2SO_4 until practically all silver is washed away; finally wash with water, anneal and weigh. A minute quantity of Ag is retained with the platinum, but it can usually be neglected. In very important work where the amount of platinum is large dissolve in *aqua regia,* evaporate the solution to dryness, take up with a drop of HCl, dilute largely with water and let the AgCl settle over night; filter on a small paper, cupel it with a little sheet lead and deduct the weight from the weight of platinum. This refinement need not be considered in materials running less than 15 or 20 oz. to the ton.

It may seem an unnecessary step to precipitate the platinum as sulphide, scorify it with silver and part it as described in the foregoing. General practice has been to ignite the ammonium-platinum-chloride precipitate and weigh the metallic residue. When this is done, however, there is danger of losing considerable platinum, which is carried away mechanically during the decomposition of the compound; furthermore, it is extremely difficult (if not impossible) to collect the finely divided residue for

*Chief chemist, Ledoux & Co., 99 John St., New York.

[1]In materials rich in palladium the small amount of AgCl + $PbCl_2$ may be distinctly pink in color and retain weighable quantities of Pd. If this is the case, the Pd may be recovered in the solution from the nitric acid parting of the gold. To do this, precipitate the silver in this liquid by adding HCl, filter off the silver chloride and evaporate the filtrate to dryness. Take up with a drop of HCl and a little water, let stand over night and filter through a very small filter. This liquid may be added to solution B before precipitating palladium with glyoxime.

weighing, and the precipitate invariably contains lead and silver. Precipitation as sulphide, scorification and cupellation with excess silver and parting with sulphuric acid overcome the difficulties inherent in handling the ammonium precipitate.

The palladium is all contained in the filtrate and washings from the platinum-ammonium-chloride precipitates (solution *B*). Add to this solution at least seven times as much di-methylglyoxime as there is Pd present (in any case, at least 0.1 gm. glyoxime). The precipitant should be dissolved in a mixture of two-thirds strong HCl and one-third water. Dilute the liquid to 250-300 c.c., heat on a steam bath for half an hour and let stand over night. Pd is precipitated as a voluminous, yellow, easily filtered glyoxime compound $(C_8H_{14}N_4O_4)_3Pd$, containing, when dried at 110° C., 31.686% of Pd. Filter the Pd precipitate on a weighed Gooch crucible and wash it, first, with dilute HCl, half and half, then with warm water and finally with alcohol; dry it at 110° to 115° C. and weigh. The disadvantage of weighing palladium on a Gooch crucible is overcome—at least to some extent—by the fact that the Pd compound contains a relatively small amount of Pd—less than one-third of its weight. This compound may also be weighed on carefully counterpoised papers; but it is better to use Gooch crucibles, if they are available, because of the relatively strong acid which is required for washing. The object in using half-and-half hydrochloric acid as a wash liquid is to dissolve out any excess of the glyoxime precipitant. This is easily soluble in moderately strong HCl, but is substantially insoluble in water.

Determination of Silver in Ores and Concentrates Containing Platinum and Palladium

By A. M. Smoot*

Make the usual crucible fusion on one-quarter, one-half or full assay ton, according to the amount of silver present. Instead of cupeling the lead button, hammer it free from slag and dissolve it in dilute nitric acid. Most of the silver passes into solution together with palladium, and perhaps a trace of platinum; but gold and most of the platinum remain insoluble. The gold and platinum retain an appreciable proportion of silver which cannot be washed out. Filter out the insoluble residue and wash it thoroughly with hot dilute nitric acid, followed by hot water. Scorify the residue once more with a little lead and dissolve the lead button as before, filtering into the beaker containing the first filtrate. In this liquid precipitate the silver as AgCl by adding standing NaCl in sufficient quantity; stir well, and if the amount of silver is small, add about ½ c.c. of strong H_2SO_4 to form a precipitate of lead sulphate. Let the silver chloride, or the silver chloride plus lead sulphate, settle over night or until the supernatant liquid is clear; filter through double filter papers; ignite and scorify the residue of silver chloride with test lead.

If the amount of palladium contained in the sample is small, the silver bead obtained by cupeling the lead button obtained by scorifying the silver chloride may be considered as sufficiently pure for ordinary purposes. It contains, of course, some palladium, and in accurate silver determinations the lead button from the first silver-chloride precipitation should be re-dissolved and the silver re-precipitated, filtered and scorified as before. The amount of palladium retained after the second precipitation and scorification is so small as to be negligible.

*Chief chemist, Ledoux & Co., 99 John St., New York.

New Method for Determining Zinc in Alloys

In a recent paper before the American Institute of Metals (Chicago meeting, September, 1914), G. E. F. Lundell and Nai Kim Bee suggested as a method for the analysis of brass and other alloys the precipitation of zinc with potassium-mercuric sulphocyanide. The precipitate has the composition $ZnHg(CNS)_4$ and may be dried at 100-108° C. and weighed.

The precipitating agent is made by dissolving 39 grams of KCNS in 200 c.c. water and then stirring in 27 grams of $HgCl_2$, slowly diluting to 1000 c.c. as this is done. If a residue remains, filter this solution.

Prepare the zinc solution to be assayed as though the pyrophosphate method were to be used, although the acid present need not be carefully neutralized. However, the solution should not contain nitrous acid nor over 5% by volume of free acid. Then add 25 to 30 c.c. of sulphocyanide reagent for each 100 c.c. of the solution. After adding the reagent, set the solution aside for from five to 30 min., during which time it should be well stirred three or four times. Filter on a gooch, dry at 100-108° C. and weigh.

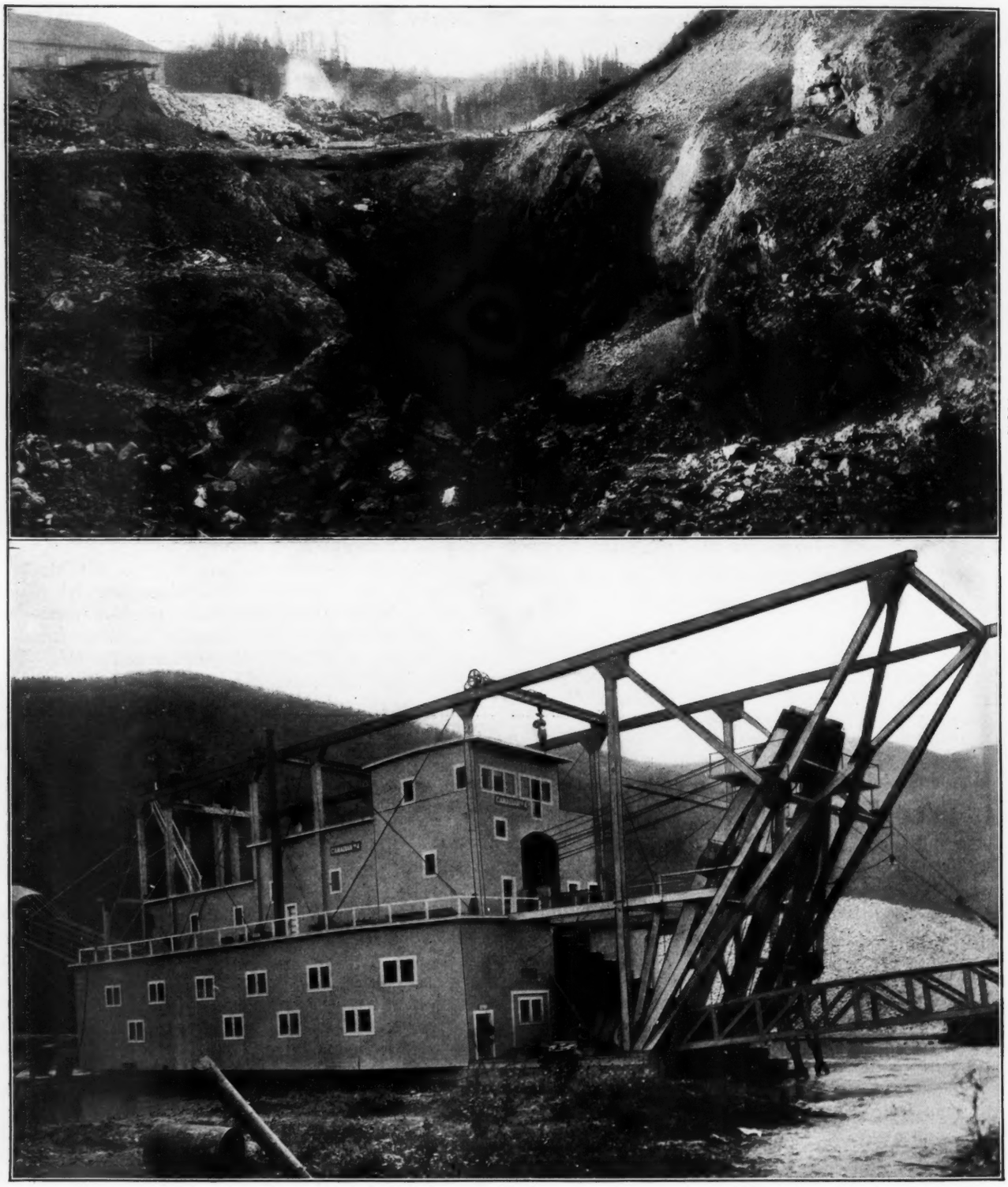
$$\text{Wt.} \times 0.1266 = \text{Zn.}$$

The interfering substances are Hg′, Cu, Bi, Cd, As‴, Co, Mn and large amounts of Ni. These give high values. K_2SO_4, $NH_4C_2H_3O_2$ and NH_4CNS give low results, as does over 10% of free acid. Alkaline solutions cannot be used. H_2S and oxides of nitrogen are undesirable. The solution must be filtered cold. The precipitate is slightly soluble in water, but practically insoluble in water containing 2% of the precipitating solution; it begins to decompose at 110° Centigrade.

A Silver-Plated Electrode in the Zinc Assay

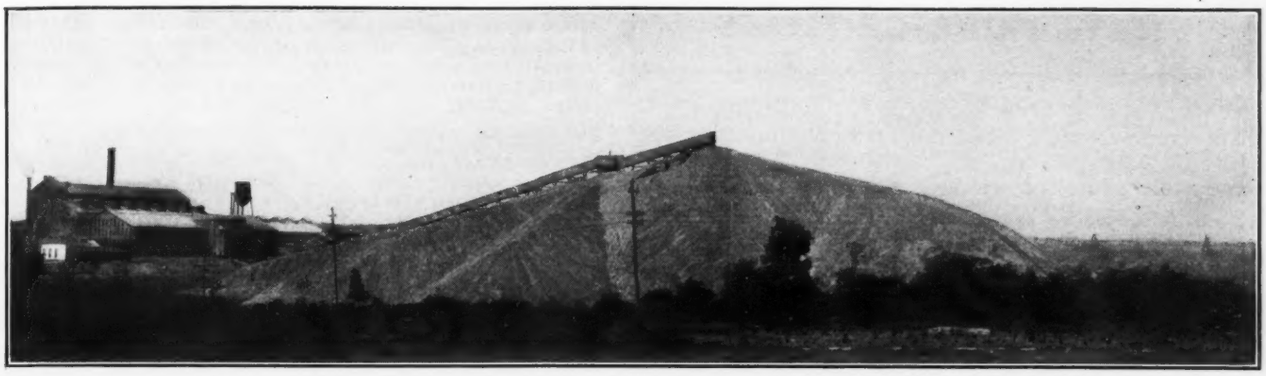
A silver-plated copper-gauze electrode can be made cheaply and is a good substitute for platinum in the electrolytic deposition of zinc, especially when alkaline cyanide solutions are employed, according to O. L. Barneby (*Journ. Am. Chem. Soc.*, June, 1914). Copper gauze of a desirable mesh is cut to a convenient size, the ends are brought together to form a cylinder and all the edges folded down. The ends are joined by interlocking folds. The spiral is supported by means of a heavy copper wire which encircles the cylinder within the upper fold and is bent at right angles for connection to the support. The folds are then sewed together by means of a copper wire. The cylinder and rod are now immersed in a dilute silver-cyanide bath and coated with silver by electrolysis, after which the unplated portion of the rod is cut off. A platinum wire is used for the anode connection. After each analysis, the zinc can be removed conveniently by the use of dilute hydrochloric acid.

Photographs from the Field

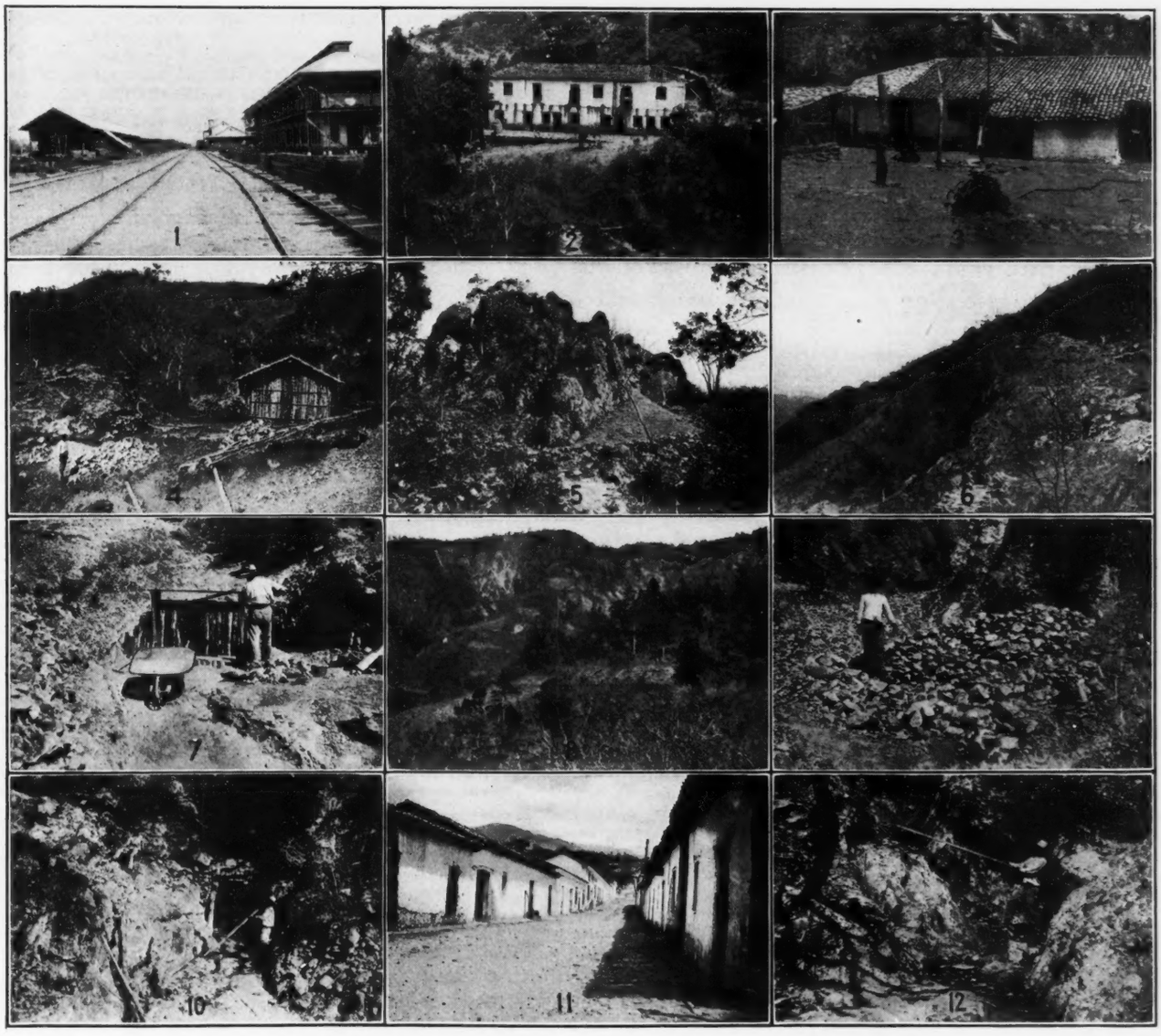


TWO VIEWS IN THE YUKON COUNTRY

Upper view—Glory hole of the Pueblo copper mine, near Whitehorse, Yukon Territory
Lower view—Canadian No. 4 dredge of the Canadian-Klondyke Gold Mining Co., Dawson



TAILINGS PILE AND STACKER AT FEDERAL LEAD CO.'S MILL, FLAT RIVER, MO.
One of the drawbacks of mill-building in a flat country



VIEWS OF THE "MINAS DE ALOTEPEQUE," EASTERN GUATEMALA

Zinc deposits which have, we understand, been examined by representatives of the New Jersey Zinc Co. 1. The station, Zacapa, on Guatemala Northern R.R. 2 and 3. An old building erected by an English company prior to 1873. 4, 5, 6 and 7. Tajo de Montenegro. 8. La Ballena. 9. Zinc-lead-copper ore from La Ballena outcrop. 10. La Ballena outcrop. 11. A street in Concepcion, a village near the mines. 12. Another outcrop of La Ballena.

NEW PUBLICATIONS

METALLURGICAL SMOKE. By Charles H. Fulton. Pp. 94, illus., Bull. 84, U. S. Bureau of Mines, Washington.

THE CONSTITUTION OF THE NATURAL SILICATES. By Frank Wigglesworth Clarke. Pp. 128. Bull. 588, U. S. Geological Survey, Washington, D. C.

GROUND WATER IN SOUTHEASTERN NEVADA. By Everett Carpenter. Pp. 86; illustrated. Water-Supply Paper 365, U. S. Geological Survey, Washington.

ANNUAL REPORT OF THE MINES OF NOVA SCOTIA FOR 1914. 6¼x9½, paper, pp. 167, illus. Commissioner of Public Works and Mines, Halifax, N. S., Canada.

THE CUSHING OIL AND GAS FIELD, OKLAHOMA. By Frank Buttram. 6x8¾, paper, pp. 106, illus. Bull. 18, Oklahoma Geological Survey, Norman, Oklahoma.

POOR'S SUMMARY OF INVESTMENT NEWS. A Reprint of the Daily Summary from April 1 to Dec. 31, 1914, for purposes of reference. 6x9, pp. 558. Poor's Manual Service, New York.

SALINES IN THE OWENS, SEARLES AND PANAMINT BASINS OF SOUTHEASTERN CALIFORNIA. By Hoyt S. Gale. Pp. 73; illustrated. Bull. 580-L, U. S. Geological Survey, Washington.

THE PETROLOGY OF THE ORIJARVI REGION IN SOUTHWESTERN FINLAND. By Pentti Eskola. Pp. 277; illustrated. Bull. 40, Commission Geologique de Finlande, Helsingfors, Finland.

LOS MARMOLES DE CARAPE. By Rolf Marstrander. In Spanish and English. 6¼x9½, paper, pp. 50, illus., Bull. 1. Talleres Graficos de la Escuela N. de Artes y Oficios, Montevideo, Uruguay.

HANDBOOK OF TABLES AND FORMULAS FOR ENGINEERS. Compiled by Clarence A. Peirce; with mathematical sections by Walter B. Carver. 4x6¾, 168 pp., illus. McGraw-Hill Book Co., New York.

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ORE DEPOSITS OF NORTHEASTERN OREGON. By Arthur M. Swartley. The Mineral Resources of Oregon, Vol. I, No. 8. Paper; 6¾x10; pp. 229; illustrated. Oregon Bureau of Mines and Geology, Portland, Oregon.

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA. Statistics for 1901-1913. By G. H. Knibbs. No. 7, 1914. 5¾x9¼, paper, pp. 1098, illus. Commonwealth Bureau of Census and Statistics, Melbourne.

THE TRANSACTIONS OF THE CANADIAN MINING INSTITUTE, 1914. Vol. XVII. 5¾x8½, paper, pp. 507, illus. Published at the office of the Secretary, H. Mortimer Lamb, Ritz-Carlton Hotel, Montreal, Que., Canada.

GEMEINFASSLICHE DARSTELLUNG DES EISENHÜTTENWESENS. Herausgegeben vom Verein Deutscher Eisenhüttenleute in Düsseldorf. Ninth edition. 6x9¼, pp. 438, illus. Verlag Stahleisen m. b. H., Düsseldorf, Germany.

PRACTICAL STAMP-MILLING AND AMALGAMATION. By H. W. MacFarren. Third Edition. With a Chapter on Arrangement and Construction Costs of Stamp Mills, by Charles T. Hutchinson. 6½x9¼ pp. 231, illus.; $2. Mining and Scientific Press, San Francisco, California.

MINERAL PRODUCTS OF THE UNITED STATES. REVIEW OF CONDITIONS AND OUTPUT IN 1912 AND 1913. By Edward W. Parker. With a Summary of Mineral Production in 1913, compiled by W. T. Thom. Mineral Resources of the U. S., 1913, Part I. Pp. 163. U. S. Geological Survey, Washington, D. C.

QUIN'S METAL HANDBOOK AND STATISTICS, 1915. Price 3s. 6d. Published by L. H. Quin, 3 East India Ave., London, E. C.

This is a useful little handbook, which gives a good many interesting metal statistics that are not commonly to be found in similar American publications. In the main, good judgment as to authorities is exhibited.

METHODS IN METALLURGICAL ANALYSIS. By Charles H. White. 4¾x7¼; pp. 356; illustrated. $2.50. D. Van Nostrand Co., New York.

This is about the best student's text-book that we have seen, as it goes at great length into the niceties of manipulation which are ordinarily not treated. As a manual for the practical assayer or chemist it seems to present very little that is new.

ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING. December, 1913, to September, 1914. By J. W. Thompson. Pp. 176. Bull. 90, U. S. Bureau of Mines, Washington.

This bulletin is the third of its kind to be published by the Bureau. There has been a wide demand for information of this character, and the Bureau has decided to issue similar bulletins with sufficient frequency to keep reasonably current the records of decisions of courts of last resort on questions relating to the mineral industry.

AN INTRODUCTION TO THE STUDY OF PHYSICAL METALLURGY. Walter Rosenhain. 5½x9; pp. 368; illustrated. $3.50. D. Van Nostrand Co., New York.

This is the first book in a new series on metallurgy under the author's general editorship. The subjects treated are: The microscopic examination of metals; the metallurgical microscope; the microstructure of pure metals and alloys; the thermal study of metals and alloys; the constitution diagram and the physical properties of alloys; typical alloy systems; the iron-carbon diagram; the mechanical testing of metals; the effect of strain on the structure of metals; the thermal treatment of metals; the mechanical treatment of metals, including casting; defects and failures in metals and alloys.

TECHNICAL METHODS OF CHEMICAL ANALYSIS, VOL. III. Edited by George Lunge. 6x9; pp. 1125; illustrated; in two parts. $18. D. Van Nostrand Co., New York.

The present volume is the last word on that portion of organic chemistry covered by it. This includes: Mineral oils; lubricants; oils, fats and waxes; special methods of analysis employed in the oil and fat industries; resins and balsams; drugs and galenicals; essential oils; tartaric and citric acids; organic preparations; rubber; vegetable tanning materials; leather; ink; sugar; starch and dextrin; alcohol, potable spirits and liqueurs; vinegar; wine; brewing materials and beer; paper; textile fibers; and inorganic colors.

MINING COSTS OF THE WORLD. A Compilation of Cost and Other Important Data on the World's Principal Mines. By Edmond Norton Skinner and H. Robinson Plate. 5x7¼, pp. 406, illus.; $5. McGraw-Hill Book Co., New York.

The presentation of costs from most of the principal mining camps of the world will prove a convenience to engineers who want to know approximately the economic conditions in any particular locality, and interesting reading for the mining fraternity in general. As a comparison of efficiencies, however, costs are worse than useless, and as a final factor in determining the possibilities of a new venture the book will not serve, since all conditions are never duplicated. The work is as well done as may be, but published costs are not always reliable, even when taken from official reports, since facts may readily be altered or concealed. As a guide the book is good, but as a tool to perform fine work it cannot be unconditionally recommended.

The Australian Zinc Industry

At Broken Hill matters look brighter now that the Broken Hill Proprietary Co. has been successful in arranging for the sale of from 40,000 to 50,000 tons of zinc concentrates, reports the Sydney correspondent of the London *Mining Journal*. It is understood that under the agreement already entered into for the delivery of this product to the United States shipments will probably be made on the basis of 7000 to 8000 tons of zinc concentrates per month. Prior to the war the average output of zinc at the parent company's mill was well up to 6000 tons per month. When operations were suspended in last August there was a substantial dump of this product, and this has been in part utilized for keeping the spelter distillation plant at Port Pirie fully supplied. The Amalgamated Zinc (De Bavay's) produces 3000 tons of zinc concentrates per week under normal conditions and the Zinc Corporation upward of 1700 tons per week, the aggregate output of zinc concentrates at the Barrier prior to the war being at the rate of about 8000 tons per week.

The attitude of the British Government in regard to the application from the Commonwealth Government for assistance in terminating the contracts with German firms for the supply of zinc concentrates, now suspended, as given in the Adelaide *Press* appears as follows: The Colonial Secretary (Mr. Harcourt) put the position clearly to Sir John McCall, the representative of the Australian Trade Committee in London, when he said: "There are many valuable contracts with Germany which Britishers might desire to enforce after the war." The natural assumption is that we as a nation have more to lose than gain by entering upon that course. But independently of any other action which may be considered necessary, the Federal Government can effectively deal with the position by entirely forbidding exports, or, as has been done with other products, forbidding exports except to Empire territory, or that of our Allies. To

specific requests for special consideration for the zinc industry, the Colonial Secretary has replied: First, that the Government will not entertain a loan for the provision of smelting works in England; second, that it is unwise to encourage the breaking off of contracts; and, third, that the Government cannot undertake to defend any company, which takes up the business, from unfair competition after the war.

Production of Copper in 1914

The production of copper in the United States, Canada, Mexico and Cuba in 1914 and previous years is given in the accompanying tables. Our figures are based uniformly upon reports received from the several producers and represent the smelters' output, which is a different thing from either the mine output or the refinery output. In the case of the Michigan production, however, the smelters are also refiners, and their figures for smelting and refining productions are consequently the same. The figures that are now presented are the revision of our preliminary figures, published last January. The alterations, either in total or in details, are insignificant.

SMELTERS' PRODUCTION OF COPPER IN THE UNITED STATES

(In Pounds)

State	1911	1912	1913	1914
Alaska	19,412,000	32,602,000	24,452,000	24,288,000
Arizona	300,578,816	357,952,962	399,849,745	387,978,852
California	36,806,762	31,069,029	32,390,272	29,515,488
Colorado	8,474,848	7,502,000	7,670,090	10,104,579
Idaho	3,745,210	5,964,542	8,434,028	4,856,460
Michigan	216,412,867	231,628,486	159,437,262	157,089,795
Montana	271,963,769	309,247,735	285,336,153	243,139,737
Nevada	65,385,728	82,530,608	84,683,961	60,078,095
New Mexico	1,518,288	27,488,912	46,953,414	64,338,892
Utah	138,336,905	131,673,803	147,591,955	153,555,902
Washington	.....	1,121,109	448,805	165,023
East and South.	19,656,971	18,592,655	24,333,014	19,213,965
Other States	1,564,207	4,396,667	4,155,135	4,257,088
Totals	1,083,856,371	1,241,770,508	1,225,735,834	1,158,581,876

COPPER PRODUCTION OF CHILE AND PERU, 1913 AND 1914

(In Pounds)

	Chile—1913	Chile—1914	Peru—1913	Peru—1914
Blister copper to U. S.	18,315,000	23,814,659	42,667,436	44,488,809
Copper in ore to U. S.	24,911,465	29,056,280	10,089,592	5,680,592
Copper to England and France	43,460,480	37,024,960	3,180,800	1,742,720
Sundries, estimated	250,000	220,000	250,000	220,000
Totals, lb.	86,936,945	90,115,899	56,187,828	52,132,121
Totals, metric tons	39,434	40,876	25,487	23,647

SMELTERS' PRODUCTION

(In Pounds)

Source	1911	1912	1913	1914
N. American ore	1,284,932,019	1,489,176,562	1,438,565,881	1,327,488,479
Foreign ore	34,392,091	53,701,307	55,803,202	50,101,308
Scrap	18,529,547	11,949,348	22,427,889	20,894,559
Totals	1,337,853,657	1,554,827,217	1,516,796,972	1,398,484,346
To foreign refiners	32,413,440	45,735,673	36,682,605	36,765,920
To American refiners	1,305,440,217	1,509,091,544	1,480,114,367	1,361,718,426
Crude copper imported	146,422,851	144,480,144	169,315,869	131,125,076
Total crude copper	1,451,863,068	1,653,471,688	1,649,430,236	1,492,843,502

SMELTERS' PRODUCTION OF COPPER IN NORTH AMERICA

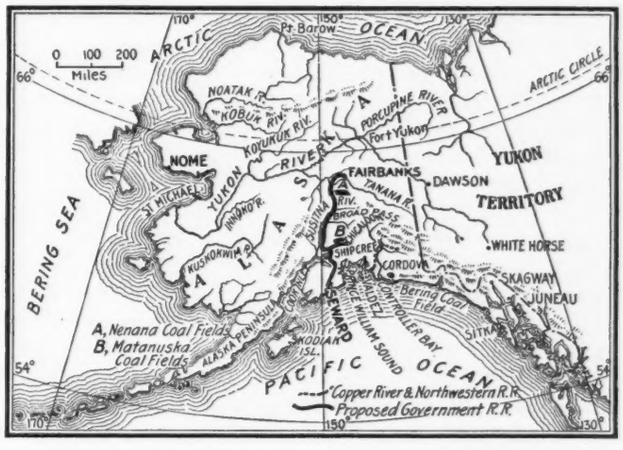
(In Pounds)

Country	1911	1912	1913	1914
United States	1,083,856,371	1,241,770,508	1,225,735,834	1,158,581,876
Canada	56,370,754	75,425,575	76,796,586	75,015,758
Mexico	136,430,331	162,295,545	128,579,656	80,108,165
Cuba	8,274,563	9,684,934	7,453,805	13,782,680
Totals	1,284,932,019	1,489,176,562	1,438,565,881	1,327,488,479

Our system of collecting the statistics from the smelters of North America enables us to arrive at the totals not only for the United States, but also for Canada, Cuba, Chile, Peru and Mexico. The details of the production in Chile and Peru are given in an accompanying table.

Route of the Government Alaskan Railroad

President Wilson on Apr. 10 announced the route of the new Alaskan railroad which the Government is to build. It is known as the Susitna route, and extends from Seward, on Resurrection Bay, to Fairbanks, on the Tanana River, a distance of 471 miles. The route includes the existing Alaska Northern R.R., which runs from Seward through the Kenai Peninsula for a distance of 71 miles to Turnagain Arm. This route is to be bought from its present owners by the Government for $1,150,000, $500,000 of which will be paid on July 1, 1915, and the remainder July 1, 1916. The contract for the purchase of the road was signed by Secretary Lane and approved by the President, subject to approval of title. From Turnagain Arm the route is to be extended through the Susitna Valley and across Broad Pass to the Tanana River, and from there on to Fairbanks. It is to be a standard-gage road. A side line is to run from Matanuska Junction into the Matanuska coal field, a distance of 38 miles. The road is to be built with its present base at Ship Creek, on Cook's Inlet, and from this point it is expected that the Matanuska coal will be shipped during the greater portion of the year. The grade from the Matanuska field to Ship Creek is 0.4%. The Alaska Northern has been purchased for a price less than its physical valuation as estimated by the Alaskan Engineering Commission and by the engineers of the Interstate Commerce Commission. Under the contract approved by the President the road is taken over free from all debt or obligation of any kind. The estimated cost of construction of this line from Seward to Fairbanks, including the Matanuska branch, is $26,800,000.



ROUTE OF THE GOVERNMENT ALASKAN RAILROAD

The President has made an order directing that the work be carried on by the Alaskan Engineering Commission, which is to have the general duty of preparing and adopting plans for construction, the employment of the force and the making of contracts for the purchase of supplies for the work. The Secretary of the Interior is authorized to designate one of the members of the commission as its chairman, who shall be in immediate charge of the work and have power of approval or disapproval of all administrative matters connected with it. In accordance with this authorization, Secretary Lane has designated W. C. Edes, the present chairman of the com-

mission. Chairman Edes is to have charge of the assignment of duties to the heads of departments, which heads shall be appointed by and report to the chairman, who shall also fix their salaries, subject to the approval of the commission as a whole. Contracts for the purchase of supplies are to be made after advertisement in the district where the supplies, in the judgment of the chairman, may best be purchased, except in cases of emergency. In construction work, competitive bids shall be secured by invitation or advertisement when practicable. The members of the commission, which consists of William C. Edes, chairman; Lieutenant Frederic Mears, late superintendent of the Panama R.R., and Thomas Riggs, Jr., are directed to proceed to Alaska at once. The chairman is to make his headquarters at Seward, Lieutenant Mears is to be stationed at Ship Creek and Mr. Riggs is to conduct surveys in the Broad Pass region.

The President charges the commission particularly with the preparation and maintenance of proper arrangements for the health of the men engaged in the work of construction and to adopt a proper system of compensation for accidents which may occur on the work in general on the lines of the system now in force in the construction of the Isthmian Canal. The system shall be such that its benefits will be applicable not only to those who are directly in the service of the commission upon salary, but also to those who may, by contract with the commission, be actually engaged in the work of construction in Alaska.

Secretary Lane said: "The work on the railroad is to begin at once. Lieutenant Mears is already on his way to Alaska. Chairman Edes and Mr. Riggs will soon follow. The first work will be the building of a wharf at Ship Creek and the dredging of a more adequate channel. From this point the railroad will be constructed northward to the Matanuska field. The probability is that not more than 40 miles of road can be constructed this year, owing to the fact that our appropriation is but $2,000,000. We have something over $500,000 remaining from the $1,000,000 authorized last year, and this will be used as the first payment on the Alaska Northern road. The work will be done in large part by stationmen, who will make direct contracts with the commission for building distinct units of the road. This method has been recommended to the President by some of the most prominent railroad constructors and is adopted generally in railroad construction in the West. At the end of this season the work done in this way will form a basis from which it may be determined whether it is wise to have the road constructed as a whole or in parts by contract. It is expected that the commission will employ a small force, chiefly composed of engineers, to supervise the construction. The few places which are to be filled will be filled exclusively upon the ground of merit and experience. I have received word of a threatened stampede to Alaska this season. The work to be undertaken by the Government does not justify any such rush. The Government itself will employ but few men, and these men of a high order of railroad engineering experience. I desire to advise those contemplating going to Alaska that there is little opportunity for employment at this time, and they must be prepared in advance for their return in the fall. We have withdrawn townsites along this route at Ship Creek, Matanuska Junction, in Susitna Valley, one in the vicinity of Broad Pass and another in Nenana River.

"The route adopted by the President will open up a territory not now served by any railroad line, and two of the great coal fields in Alaska, one the Matanuska field, which contains high-grade bituminous coal acceptable to the Navy, and, second, the Nenana coal, near the Tanana River, which is a great body of high-grade lignite that will serve the interior of Alaska."

The description of the route approved by the President is as follows:

For a main line of railroad: Commencing at the Town of Seward on the westerly shore of Resurrection Bay, Alaska; thence following along said westerly shore in a northerly direction to the head of said bay; thence following up the drainage of Salmon Creek to a summit between said drainage and the drainage of Snow River; thence following the drainage of Snow River to Kenai Lake; thence continuing northerly along the easterly shore of Kenai Lake, along Falls Creek, along the shores of Lower and Upper Trail Lake, and up Trail Creek to a summit in the Kenai Mountains near Mile 45 from Seward; thence descending along the drainage of Placer River to the head of Turnagain Arm of Cook Inlet; thence following the northeasterly shore of said Turnagain Arm and crossing Portage Creek and Twenty Mile River to the mouth of Kern Creek near Mile 71 from Seward; thence in a northwesterly direction along the shore of Turnagain Arm to near the mouth of Big Rabbit Creek; thence leaving Turnagain Arm and running northerly to a summit in section 26, Township 14 North, Range 3 West, Seward Meridian; thence running northeasterly to near the head of Knik Arm of Cook Inlet; thence running northerly across the flats at the head of said arm and crossing Knik and Matanuska Rivers, to a point about two miles north of the Matanuska River; thence running in a westerly and northwesterly direction, crossing the Little Susitna River and following along the southwesterly slopes of Bald Mountain to Willow Creek, a tributary of the Susitna River; thence in a northerly direction following the drainage of the Susitna and Chulitna Rivers to Broad Pass, situated in the main Alaska range of mountains; thence crossing Broad Pass and entering the drainage of the Nenana River; thence continuing northward following the drainage of the Nenana River to the Tanana River, the total distance from Seward being 416 miles, more or less.

Also starting from a point on the above-described line, situated two miles more or less northerly from where said line crosses the Matanuska River, and thence running in an easterly direction following the drainage of said Matanuska River and its tributaries, a distance of 38 miles, more or less, to the Matanuska coal fields.

Mine La Motte

ST. LOUIS CORRESPONDENCE

The Mine La Motte property, embracing about 52 sq.mi. in Madison and St. Francois Counties, Mo., has been sold for $600,000 to the company that has been operating the mines under a lease for more than a year. This company, which is known as the Mine La Motte Co., is said to be affiliated with the National Lead Co.

Mine La Motte was sold about 12 years ago for $800,000 to Daugherty and Albers, who organized the Mine La Motte Lead & Smelting Co. with a capital of $3,000,000. About one-half of this stock was sold for a little more than $1,000,000, and the money paid for the mine, new mills and various improvements. Then $100,000 was borrowed to build a new smeltery and refining plant; but before the latter was ready to operate, the stockholders got into a quarrel among themselves, and as they preferred to wrangle rather than to pull together and make a success of the business, the property has paid nothing until taken over by the present owners. The old stockholders who paid $7 to $8 per share for their stock will now realize about 10c. per share for it.

The new company, which is composed of competent men, or at least has competent mining men to manage it,

has been making money, and if all the metals are utilized the property can be made to pay considerably more.

The Catherine mine, which was shut down last year owing to the low price of lead, will soon be in operation again. This mine and the Fleming land adjoining are under lease to the Federal Lead Co. Other tracts of mining lands in Madison County have been inspected recently and it is believed that some of these will soon change hands.

Ray Consolidated in 1914

The report for 1914 of the Ray Consolidated Copper Co., Ray, Ariz., shows a production of 57,004,281 lb. of refined copper, 51,608 oz. of silver and 306,532 oz. of gold. Dividends were paid in March and June aggregating $1,089,322, making total dividends to date of $2,720,826. The mill treated 2,427,700 tons of ore averaging 35.2 lb. of copper per ton, and 2591 tons of ore averaging 237.34 lb. per ton were shipped to smelters. The average net yield in refined copper per ton of ore treated was about 23.5 lb. The accompanying table gives a summary of the total production:

TOTAL PRODUCTION OF RAY CONSOLIDATED

Year	Tons of Ore	Lb.Cu. per Ton	Total Lb. Refined Copper Prod.	Value of Other Metals
1911	618,519	21.9	14,935,047	$926
1912	1,565,875	22.2	34,674,275	8,269
1913	2,365,296	22.2	52,341,029	51,396
1914	2,430,291	23.5	57,004,281	34,761
Total	7,042,981	22.6	158,954,632	$95,352

During the first seven months of 1914 the plants were running at about full capacity, but with the beginning of the war production was cut to 50% of normal capacity. The financial statements show an increase of 4376 shares in issued capital stock and the redemption of $269,000 of first mortgage bonds. The total outstanding capital stock at the end of the year was 1,454,929 shares and $2,708,000 of bonds. Of the new stock issued 4300 shares were issued in conversion of bonds and 76 shares in exchange for Ray Central stock. In order that the financial transactions of the company may be easily understood the statements given in the report have been fully analyzed and put in form shown in the accompanying tables.

TOTAL RECEIPTS AND TOTAL EXPENDITURES OF THE RAY CONSOLIDATED COPPER CO. DURING 1914

Receipts:		
From sale of metal products		$7,597,733
Income from investments and miscellaneous sources		338,923
From capital stock at par value		43,760
From premiums on sale of stock		28,800
Total receipts from all sources		$8,009,216
Expenditures:		
Expenditures charged to operations	$5,281,484	
Bond interest paid and advances	259,540	
Property account	1,029	
Construction and equipment	92,438	
Deferred development	286,778	
Investments	55,151	
First mortgage bonds redeemed	269,000	
Total expenditures	$6,245,420	
Paid out in dividends	1,089,322	
Added to quick assets	674,465	
To balance with total receipts	$8,009,207	
Balance of quick assets at end of 1914		$2,185,552
Balance of quick assets at end of 1913		1,511,087
Increase in quick assets in 1914		$674,465
Dividends paid in 1914		1,089,322
Amount actually available from 1914		$1,763,787

The total development during the year was 75,261 ft., which is 9468 ft. less than in 1913. Development since the commencement of mining operations to the end of 1914 amounts to 452,233 ft., or about 85 miles. Of this about 34 miles has been destroyed by mining operations. It is stated that the mine is now thoroughly opened, so that all production requirements may be easily met.

The ore reserves have been recalculated and were estimated at Dec. 31, 1914, to contain 74,765,789 tons averaging 2.214% copper. This ore underlies an area of 205.2 acres. This recalculated tonnage is about 1.5% less than the former estimate; but to offset this the copper contents indicated by the new data obtained raise the average grade about 1%. This new estimate was made after exploring the margin of the main orebody.

ANALYSIS OF TOTAL RECEIPTS AND EXPENDITURES

Receipts from Operations		
From sale of metal products		$7,597,724
From investments and miscellaneous income		338,923
Total operating revenue		$7,936,647
Expenditures for Operations—Current and Deferred		
Current operations:		
Mining, milling and taxes	$2,742,900	
Treatment, refining and freight	2,158,624	
Selling commissions	76,497	
Mine development extinguishment	303,463	
Total current operating expenses reported		5,281,484
Total income reported		$2,655,163
Less bond interest and advances		259,540
Net profit as shown in report for 1914		$2,395,623
Deferred expenditures to operations:		
For property account	$1,029	
For construction and equipment	92,438	
For deferred development	286,778	
Total expenditures charged to capital accounts		380,245
Balance over current and deferred expenditures		$2,015,378
Other Expenditures		
Investments	$55,152	
First mortgage bonds redeemed	269,000	
	$324,152	
Less receipts from capital stock	72,560	
Net amount paid out from earnings for investments and bonds		251,592
Amount from 1914 actually available for dividends		$1,763,787
Dividends paid		1,089,322
Balance added to quick assets		$674,465

During the second quarter of the year the average daily output was 8296 tons. A total of 2,429,330 tons was mined, of which 2591 tons was shipped to the smelter; the remainder was concentrating ore and averaged 1.7604% copper. The following table illustrates the constant increase in tonnage produced from the reserve drawing during the last three years and for the operating period to date, which has an important bearing on the decrease in mining costs:

	Per Cent. of Total Tonnage			
	1914	1913	1912	To Date
Development	9	10	29	17.5
Mining, active stopes	21	33	45	32.3
Mining, reserve drawing	70	57	26	50.2

It is estimated that there is a reserve of 5,000,000 tons of broken ore in the stopes. Mining cost was 62.42c. per ton, compared with 73.23c. in 1913. This cost includes general fixed charges and the cost of coarse crushing and loading the ore into cars. The cost of crushing and loading into cars costs 3.1c. per ton, making the mining cost proper 59.32c. per ton. Eliminating No. 3 shaft, where the cost of mining is higher on account of square setting, the cost was 54.21c. per ton.

If the milling plant had operated during the last of the year at the same rate as during the first half, the year's tonnage would have been 3,006,129 tons. Mill ore averaged 1.76% copper, and the average rate of extraction was 67.88%. The cost of milling was 49.88c. per ton, compared with 51.93c. for 1913. The average

grade of concentrates was 19.25%, compared with 18.55% in 1913.

The average cost per pound of refined copper was 8.868c. after crediting earnings from the railroad. The combined cost of refined copper from milling and shipping ore was 8.839c. per lb. These costs include all operating and general charges and 12.5c. per ton of ore milled for development charges. By crediting all miscellaneous income to cost, the net cost of copper produced was 8.763c. per lb. No new construction work is contemplated during the coming year. Some changes are contemplated in the milling practice that will require incidental changes so far as mechanical arrangement is concerned.

Villa's New Mining Regulations

According to press dispatches of Apr. 13, the British Foreign Office has instructed the British chargé d'affaires at Mexico City to lodge a protest with Gen. Villa against the new mining regulations promulgated by the Villa régime.

The Foreign Office took this action upon the receipt of advices from the chargé to the effect that the mining regulations in question amounted virtually to confiscation of foreign mining interests.

In response to inquiries from the State Department, the Villa authorities at Chihuahua have given assurances that the new mining regulations are intended to prevent the purchase of idle mining properties by speculators, and that there is no intention of injuring "all legitimate mining industries."

The Department issued the following statement on Apr. 13:

> With reference to the new mining law, the Department is informed that it is not the intention of the authorities at Chihuahua to injure all legitimate mining industries, and that each company or individual may make representations to the Minister of Fomento at Chihuahua and secure exemption from the provisions of the recent decree, if such exemption is thought to be justified.
>
> It is stated that the new laws are intended to prevent the purchase of mining properties that are now dormant by speculators who would hold them to sell at immense profits.
>
> The Department is in receipt of an official report on this mining decree, in which it stated that it appears to be advisable for mining men, especially those who have working properties, to take up the matter at once in Chihuahua.

It would perhaps have been more reassuring had the Department said "any" instead of "all legitimate mining industries."

Alaska Ebner

The United States Smelting, Mining & Refining Co. has secured control of the Ebner gold mine at Juneau, Alaska, at a foreclosure sale in New York this week. If the ownership, as the result of this sale, is not set aside by court proceedings, the Ebner properties will have cost the Smelting company approximately $500,000.

In the JOURNAL of Mar. 27 were given the details of the financial scheme suggested for liquidating the claims of the Smelting company against the Ebner. An extension of one week was granted to the bondholders' committee to enable it to make an effort to provide some different financial arrangement, but it failed to accomplish this and the foreclosure sale resulted.

According to local newspapers, suit has already been instituted in the Federal Court in New York on behalf of some of the bondholders of the Ebner company, seeking to set aside contracts between their company and the Smelting company on the ground that the bondholders' committee exceeded its authority in permitting new debts to arise without permission from the bondholders and that clauses of the contract with the Smelting company were usurious. This suit by the bondholders was brought against the committee, but the Smelting company also is named as a defendant.

NEW PATENTS

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALUMINUM OXIDE—Production of Aluminum Oxide. Gustave Schwahn, Belleville, Ill. (U. S. Nos. 1,132,736, 1,132,737 and 1,132,738; Mar. 23, 1915.)

AMALGAMATOR. Charles H. Farmer, Ashland, Ore. (U. S. No. 1,132,317; Mar. 16, 1915.)

AMALGAMATOR. John C. Wood, Monero, N. M. (U. S. No. 1,133,210; Mar. 23, 1915.)

COPPER—Electrolytic Process of Producing Copper. Marcel Perreur-Lloyd, Boulogne-sur-Seine, France. (U. S. No. 1,133,059; Mar. 23, 1915.)

COPPER LEACHING—Process of Extracting Copper. Centennial Harry Benedict, Lake Linden, Mich. (U. S. No. 1,131,986; Mar. 16, 1915.)

CRUSHING—Apparatus for Crushing or Recrushing Rocks, Ores, Etc. Milton T. Thompson, Mexico, Mexico. (U. S. No. 1,132,047; Mar. 16, 1915.)

CRUSHING—Lining Plate for Ball Mills. Walter Brinton, Wilmington, Del., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me., and Chicago, Ill. (U. S. 1,132,909; Mar. 23, 1915.)

DESULPHURIZING—Process for Desulphurizing Ores. Giovanni Fusina, Genoa, Italy. (U. S. No. 1,131,691; Mar. 16, 1915.)

DRILL—Rock Drill. Vilhelm P. Kessel, San Francisco, Calif. (U. S. No. 1,132,276; Mar. 16, 1915.)

DRILL—Rock-Drill Chuck. Martin Thomas Taylor, Phoenix Mines, near Liskeard, Cornwall, England, and John Francis Gardiner, Mount Chalmers, Queensland, Australia. (U. S. No. 1,132,636; Mar. 23, 1915.)

DRILLS—Attachment for Drill Chucks. John E. Erickson, Tonopah, Nev., assignor of two-thirds to J. E. McNamara and J. H. Frisby, Tonopah, Nev. (U. S. No. 1,131,918; Mar. 16, 1915.)

DRILLS—Extension Frame for Mining Drills. George W. Morgan and Lon Evans, Commerce, Okla. (U. S. No. 1,133,492; Mar. 30, 1915.)

ELECTRIC FURNACE. John W. Brown, Lakewood, Ohio, assignor to National Carbon Co., Cleveland, Ohio. (U. S. No. 1,134,817; Apr. 6, 1915.)

FERROSILICON—Crystalline Ferrosilicon Product and Method of Making the Same. Herbert Champion Harrison, Lockport, N. Y., assignor, by mesne assignments, to Electro Metallurgical Co. (U. S. No. 1,134,127; Apr. 6, 1915.)

FERROSILICON ALLOYS of a Definite Composition. Herbert Champion Harrison, Lockport, N. Y., assignor, by mesne assignments, to Electro Metallurgical Co. (U. S. No. 1,134,129; Apr. 6, 1915.)

FLOTATION PROCESS—Apparatus for Separating Minerals by Flotation. Bernard MacDonald, Los Angeles, Calif. (U. S. No. 1,134,690; Apr. 6, 1915.)

GASES—Apparatus for Cooling, Washing and Mixing Gases. Hans E. Theisen, Munich, Germany. (U. S. No. 1,131,966; Mar. 16, 1915.)

GASES—Apparatus for Separating Suspended Particles from Gases. Walter August Schmidt and George Clifford Roberts, Los Angeles, Calif., assignors to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,132,124; Mar. 16, 1915.)

GASES—Apparatus for Trapping Particles in Suspension in Gas Currents. Thomas E. Murray and Charles B. Grady, New York, N. Y.; said Grady assignor to said Murray. (U. S. No. 1,132,677 and 1,132,678; Mar. 23, 1915.)

JIG. Guy H. Elmore, Swarthmore, Penn. (U. S. No. 1,132,464; Mar. 16, 1915.)

LAMP—Miner's Safety Lamp. Ernest F. Koehler, Hudson, Mass., assignor, by mesne assignments, to E. H. Kingsbury, agent, Marlborough, Mass. (U. S. No. 1,132,522; Mar. 16, 1915.)

LUBRICANT and Process of Making Same. Alexander Warrell, Worcester, Mass., assignor to Continental Asbestos Corporation, Worcester, Mass. (U. S. No. 1,133,204; Mar. 23, 1915.)

ROASTING—Metallurgical Furnace. Utley Wedge, Ardmore, Penn. (U. S. Nos. 1,133,828 and 1,133,829; Mar. 30, 1915.)

SMELTER SMOKE—Process of Preventing Escape of Noxious Gases in Smelting. William A. Hall, New York, N. Y. (U. S. No. 1,133,637; Mar. 30, 1915.)

SULPHUR—Production of Sulphur from Pyrites and Other Metallic Sulphides. William A. Hall, New York, N. Y. (U. S. No. 1,133,636; Mar. 30, 1915.)

ZINC—Roasting of Compounds or Ores Containing Zinc. Augustin Leon Jean Queneau, Philadelphia, Penn. (U. S. No. 1,132,684; Mar. 23, 1915.)

Editorials

What of Copper After the War?

The remarkable improvement of copper during the first quarter of 1915 renewed the courage of copper producers. They are now enjoying a prosperity that six months ago no one ventured to hope. However, it is recognized that the recent great demand for copper has been chiefly for military purposes (the consumption for peaceful purposes in this country has failed so far to increase materially) and producers are already considering the question of the prospects for copper after the war.

There are two views. The pessimistic view is that termination of the war will be accompanied by a collapse in the copper market, owing to the production being far in excess of the consumption when the military buying ceases. Those who take this view consider that after the war the countries of Europe will be prostrate, lacking the means even to rebuild what has been destroyed.

On the other hand, the optimists consider that Europe will not be prostrate, that rebuilding will be inaugurated immediately and that enormous quantities of copper will have to be purchased at once in order to replenish the normal stocks of manufacturers, estimated at several months' supply on the average, which already have been drawn down to the irreducible minimum, especially in Germany, in order to carry on the war. Those taking this view believe that termination of the war will be followed not by a slump in copper but by a further rise.

Among the offices of the big producers there is a sharp division of opinion respecting the above-cited forecasts. We are disposed to think that the optimistic view predominates. It is fresh in the minds of everybody that six months ago, when opinions were practically unanimous that copper was in a hopeless situation, the views were wholly wrong, and in forecasting another six months nobody pretends to be cocksure. The unexpected happened once, and probably will happen again. It is sufficient now for everybody to rejoice over the good times that have come, and it is not worth while to worry about the future.

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A Revival in Mining?

The improvement in sentiment in this country is already being reflected by increased interest in new mining enterprises. The Alaska-Juneau Gold Co., which owns a portion of the great lode back of Juneau, Alaska, two weeks ago offered 400,000 shares of its treasury stock at $10 per share in New York. On Monday of this week it was announced that allotments would be only 25%, the issue having been oversubscribed four times. The Alaska-Juneau property adjoins that of the Alaska-Gastineau. The company is directed by Messrs. Bradley, Requa and McKenzie, of San Francisco.

Naturally the success of this company and the Alaska-Gastineau (Alaska Gold Mines Co.) is inspiring all kinds of advertising of other companies, claiming to have extensions, offshoots or spurs of the Juneau lode. The development of a bull market in Wall St., where much money is being made speculatively, leads directly to interest in mining speculation. The man who has just made $100,000 in stocks is promptly receptive to the idea of putting a tenth of it into a project for driving a tunnel somewhere which will cut a vein 1000 ft. below its outcrop and prove millions of tons of ore, the only risk being that the ore may not extend downward so far. However, when speculative persons are making money they are eager to take sporting chances, which often result in making mines and, anyway, produce activity in the mining industry. We think that now we are just beginning to discern renewed interest in mining. The temper of our people has become optimistic.

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Dredging in the Philippines

Comparatively little attention has been directed by Americans to the Philippine Islands as a field for placer operations. To a great extent this is due to the failure of some of the early ventures in this field. Australasians, however, came in and with inferior dredging equipment proved that there was auriferous gravel capable of profitable exploitation. Later more modern American dredges were brought in, but the established dredging operators in the United States remained apathetic until the high yields and continued increase in the number of dredges caused some awakening of interest and the sending of exploratory parties.

Most of the dredging to date has been in the Paracale district of the Province of Ambos Camarines, Island of Luzon. Other gold placers exist in the archipelago, but not enough work has yet been done to demonstrate their adaptability to dredging. Several regions, including Tayabas, Rizal and Surigao, have been investigated and equipment ordered; in the latter province a hydraulicking plant has been placed on the Cansuran property.

The first two dredges, sent to the Philippines about 10 years ago, were both failures; one was wrecked by a storm and the other was dismantled and rebuilt in the Paracale field, where the number of dredges has increased rapidly since 1912. At the beginning of 1913 four dredges were operating in this field, and another was added to the list before the end of the year. Two new dredges were completed early in 1914 and an all-steel dredge for this district was being manufactured in Australia.

There are a number of Australasian dredges already operating in this field, but the best and most modern dredges, on the whole, are those supplied by American manufacturers. Up to the present the areas exploited have been comparatively small and rich. The gold, as a rule, is fine and the auriferous gravel is usually overlain by an overburden containing clay and sunken timber. Onerous conditions are thus imposed. When dredging was begun in the Paracale field, 50c. ground in one instance proved unprofitable; but now a well-known operator predicts that with improved equipment 12.5c. ground will be profitably dredged. The dredges are

gradually being adapted to the conditions of the district as the local problems are being more thoroughly realized. A contract has recently been let to an American designer and part of the material has been shipped for another dredge in Ambos Camarines. This dredge, like the others in the Paracale district, will operate in salt water, and embodies a number of interesting features, which we hope to describe later.

A deterrent to Philippine enterprises of all sorts has been the proposal of the present Administration to withdraw our protection from these islands; with the prospect of native control, new enterprises in the Philippines have not appealed to capitalists. Many Americans, however, feel that conditions in the Philippines will not warrant withdrawing our guarantee of order for many years, and it seems probable that the United States protectorate will actually outlast the life of most mining enterprises that might now be undertaken. At any rate, a number of dredging operations there are proving profitable, and may be more so as the designers and operators of the dredges become more familiar with the problems of this field.

Factors in the Zinc Situation

The news in our market report this week that one of the old coal smelteries at Pittsburg, Kan., idle for 15 years, is to be put into commission again shows that the extraordinary price for spelter it not only restoring to use the moribund and inactive smelting capacity, but also the abandoned capacity, which has not appeared on the smelting list for many years. This illustrates one of the factors operating to ameliorate the present acute situation. Those factors are increasing production and decreasing consumption. Their development will be gradual, their results for a while may be imperceptible, but the process is inexorable, and ere long it will be manifest to everybody. This may be in a month, maybe a little later, maybe a little sooner, but it will be. The process began emphatically in March, but was checked by the strike among the Kansas-Oklahoma smelters and other things. We may even see a recurrence of 10c. for prompt spelter before the tendency toward a return to normal conditions is clearly shown; but already the factors are at work.

An important point is that the shortage in spelter supply has been simply the result of shortage in smelting capacity, not of ore supply. Indeed, zinc ore is a drug on the market, which explains adequately why the price for ore is relatively low. Smelters taking in ore on sliding-scale contracts have generally restricted shippers to the contractual minimum. Not only is it dangerous to stock up with ore at present prices, but also ore may be bought far more advantageously in the open market. This is equivalent to saying that smelting margins are now large, and the smelters, after several lean years, are temporarily making large profits, which of course is precisely what brings into use the antique smelteries of Pittsburg, Kan.

Naturally the same developments are taking place in Great Britain and presumably everywhere else, outside of Belgium, Germany, Poland and Galicia, where zinc smelting is practiced.

On the other side, consumption—i.e., consumption for peaceful purposes—is being drastically curtailed. Reports from our own galvanizing districts and from those of Great Britain agree as to this. This has been invariably the experience whenever the price for spelter has risen above 7c. The cost of galvanized sheets is then so increased that the ultimate consumer prefers to buy black sheets and paint them.

Dressed Lumber

It is worth while to call attention to a somewhat interesting point made by Mr. Linke in an article published as a detail of practical mining in this week's issue. Mr. Linke brings out the fact that it is cheaper and better to buy for shaft timbering lumber which has been surfaced on two sides, *S1S1E,* inasmuch as the cost of the surfacing is more than paid for in the lower cost of freight. This of course depends on the situation of the point at which the timber is to be delivered. If the mine were near a sawmill, particularly if this sawmill did not have a planing mill connected with it, it would not pay to attempt to use dressed lumber, in all probability.

It might also be brought out that the dressing of the timber on two sides makes the framing much easier, as giving proper surfaces from which to work. If it is worth while to use properly surfaced lumber in shaft timbering, it is doubly or trebly so when the material is to go into a mill structure or any other building. In such case the saving in carpenter work compensates over and over again for the extra cost of the more highly finished material. And if it is used in such a way as to require painting, a still further, and perhaps even greater, saving is effected in the much smaller quantity of paint required to cover a smooth surface.

In this connection it may be said that dimensions in mine timber are only rough approximations in many cases; the mining engineer has often to work with lumber which, to put it colloquially, is pretty fierce. This is particularly the case when the mine gets its lumber from some small local mill in which the accuracy of the cutting is anything but mathematical. We remember a New Mexican property which was forced to use lumber of which every stick was a wedge. That is, a nominally 4x4-in. piece might start at 2x4 in. on one end and bring up to 4x6 in. on the other. Yet even this was better than the case of many Mexican mines where the only supply available is either whipsawed or hewed, when a square section is desired at all. The results from hewing are sometimes extraordinary. One property in central Mexico, where the timbers had to be hauled in by a bull team for five or ten miles, in order to get a stick planed true to 10x10 in., had to order a 12x12-in., and to deliver a 12x12-in., the woodcutters had to start with a 14x14-in. stick in the woods, to allow for the excessive wear over the rough roads and trails.

Boston Gone Zinc-Crazy

About every so often somebody rises to criticize the quotations of the metal markets by the JOURNAL, always of course for being too low, for surely in the mind of a seller of ore they never would or could be too high. Here is the latest from the *Boston News Bureau* in an article about the Butte & Superior company: "And in spelter as well as in copper some of the recent prices quoted by this paper have been a joke. . . . These quotations have been for weeks under the real market."

Such comments are apt to emanate from Boston, where there are many axes to grind. It is always useful to consider what they are. In the present case Boston has gone crazy over zinc. The interesting journal that we have quoted gravely publishes editorials about spelter at 9c. (an advance of 100% in six months) having come finally to its own. The public is expected by autosuggestion to become interested in zinc shares. The "real market" for spelter is the top price that anybody realizes on small tonnages of prompt spelter in a naturally cornered market, and anything indicating return to ordinary conditions is resented. It looks as if the good luck that has befallen the zinc industry is producing some plain hoggishness.

BY THE WAY

There appears to be no lack of engineers in this country, though an "abundant" lack of jobs. According to an Associated Press dispatch from Washington, 35,000 applications have been received by the engineering commission in charge of the proposed Alaskan railroads, and "none specifies or asks for common labor."

Efficiency is a great thing. Efficiency Society is so efficient that it always leaves out a "the" before its name. The prefix is inefficient. But some recent literature from Efficiency Society (without a "the") requests the recipient to fill out an inclosed application for membership and inclose with it a check covering the dues, but nothing is said as to what the dues are. This is applied efficiency to the $(n + 1)$th power.

In some recent promoters' literature is (to the miner) a rather amusing description of an interview in his New York office with an engineer in charge of one of the big Alaskan mines, which ends: "And Mr. —— read the tenth telegram from Alaska that had been placed on his desk as he talked." Which moves us to offer three suggestions to the engineer, one of which should be followed: (1) Fire the garrulous mine foreman; (2) or build a private telegraph line to Alaska; (3) or get on the job in Alaska.

Every Mexican commandant drives dull care away by manufacturing his own currency, thus enabling his army to live honestly and to pay as it goes. To be sure, arguments sometimes have to be used to circulate a new brand

DINERO MEXICANO

of paper and ink, but an argument à la Mauser is indeed unanswerable! A recent happy thought in high financial circles is to issue so-called money about the size of a subway ticket, but which has a time limit. This has the effect of keeping the *peones* hustling to get rid of it before its value disappears, which is a day or two before the time at which it would naturally wear out.

Borax Consolidated, Ltd., has in times past enjoyed great advantages from the world-wide character of its business, since if trade were bad in one or more countries, compensation was to be had elsewhere. At present, however, the company is in the position of being hit in many places at the same time. The company supplies most of the raw material to refiners of borax and boric acid, and had an especially large trade in Germany and Austria, where the enameling and glass industries consume thousands of tons annually. This is of course entirely cut off during the war, and in respect to other countries, such as France and Russia, there is so far only a small demand, owing to stoppage of manufacture and also to difficulties in distributing goods over the railways. An improvement in the last-named countries, however, is hoped for. The profits for the year ended Sept. 30, 1914, were $1,672,078, about $88,000 less than for the previous year, which was the highest in the history of the company. In regard to its mining operations, the chairman, after referring to the completion of the Death Valley R.R. in California in November, said: "We have in connection with the building of the railway taken the opportunity to erect at a central spot a large calcining plant for the treatment of the ore, and this establishment will enable us to deal with a large amount, sufficient not only for the requirements of our refineries in the United States, but also for such quantities as we may require for export. This has necessitated a large outlay, but the expenditure places us in a position to produce at the lowest possible cost all the calcined material we may require for export. In Chile, where we have hitherto had a large output from our deposits (ulexite, $CaNaB_5O_9.8H_2O$), an export duty of 10s. per ton has just been imposed upon 'borate of lime,' and in Peru, where our negotiations for an exemption from duty for a period of years have, owing to the change of government, fallen through, it has been proposed that a duty should be imposed. It seems to be injudicious to place an export duty upon a raw material which exists in several countries, as competition will necessitate a reduction of output where costs tend to increase and divert it to that place which can export at the lowest cost. Owning, as we do, properties not only in Chile, Peru and Bolivia, but also in the United States and Asia Minor, we can make our largest production from the most economical point. . . . Our boracite ($Mg_7Cl_2B_{16}O_{30}$) mines are situated in Asia Minor. [Pandermite, a variety of colemanite ($Ca_2B_6O_{11}.5H_2O$), is reported by Moses & Parsons as occurring in gypsum near Panderma on the Sea of Marmora.—EDITOR.] The inclusion of Turkey in the war has stopped the working of the mine, but we have recent information that, while confiscation of alien property in the form of gasworks, waterworks, railroads, etc., has taken place, no interference with our property has occurred other than that fuel has been commandeered." There is little danger of a shortage in the borax supply, either by war or by governmental restrictions in South America. There is, indeed, a prospect of a greatly increased supply from the United States when the commercial exploitation of Searles Lake begins. Its brine is estimated to contain about 6,000,000 tons of borax. As borax would practically be a byproduct in connection with the utilization of the Searles Lake brine as a source of potash, the concurrent production of borax from Searles Lake may easily dominate the borax market.

PERSONALS

H. F. Le Fevre is manager of La Union mine in Costa Rica.

B. B. Thayer left for Butte Apr. 8, expecting to be back in New York about May 15.

G. L. ("Tex") Rickard has returned from his ranch in South America for a short visit.

"Diamondfield Jack" Davis was recently in the Amalie mining district, Kern County, California.

Wm. Spence Black has recently become manager of the Mobile mine, in the Goodsprings district of Nevada.

Gen. Frank Hall, veteran mining editor of the "Denver Post," has returned to his desk after a three-months' vacation in Texas.

William Braden arrived in New York on Apr. 1 from Chile. After a trip to Butte, he will return to New York and expects to sail for Chile late in May.

S. W. Cohen is in Nicaragua superintending investigation of the Bonanza gold mine, which is under option to the Crown Reserve Mining Co. of Cobalt.

F. Chas. Merry, formerly superintendent for the Ferguson Mines, Ltd., with silver-lead mines in the Lardeau District of British Columbia, has gone to Utah.

F. M. Sanders, of Sanders Brothers & Co., London, dealers in iron and steel, is now in the United States on business connected with exports to Great Britain.

William Bremer has resigned as president of the Standard Aluminum Co. at Two Rivers, Wis. Herman Wentdorf, late secretary, succeeds Mr. Bremer as president.

W. V. DeCamp, recently connected with the United Verde engineering staff, has succeeded Henry Wirtz, resigned, as superintendent of the Bluebell mine in Arizona.

J. F. Mitchell-Roberts has resigned his position as chief engineer to the Wilfley Mining Machinery Co. of London to take up private work; he will be absent from London for about nine months.

W. F. Davis, superintendent of the bessemer department of the Cambria Steel Co., Johnstown, Penn., now has charge of both the bessemer and openhearth departments. C. A. Alexander, former head of the openhearth department, is engaged in special work for the company.

Lucius W. Mayer, for the past seven years connected with the New York office of A. Chester Beatty, has joined the organization of Eugene Meyer, Jr. & Co., 18 Wall Street, as mining engineer for that banking house which has extensive interests in a number of important copper-mining companies.

Robert G. Drinnan, who for 15 years has been closely associated with the management of coal mines in the Crowsnest District of British Columbia and others in Alberta, has been appointed general manager for the Hillcrest Collieries, Ltd., with coal mines in the Blairmore-Frank District, Alberta.

Frederic Keffer, for 17 years with the British Columbia Copper Co. as general manager, and later as consulting engineer and geologist, has resigned and will open offices at Spokane, Wash., as consulting engineer, in partnership with Henry Johns, who was for many years mine superintendent for the same company.

Baird Halberstadt, long assistant state geologist of Pennsylvania and well known for his work as geologist and cartographer in the anthracite region of that state, will have a reception at Pottsville, Penn., Apr. 21, to celebrate the conclusion of one-third of a century in geological work. A large number of guests will attend.

B. L. Thane, general manager of the Perseverance mine at Juneau, Alaska, announces the promotion of G. T. Jackson, the present superintendent to assistant manager, and the promotion of B. B. Neidling of Kensington to take Jackson's place. It was also announced that more buildings would be erected at once at the mine and mill for the housing of the men, a larger crew being put on the ground this summer.

A. Chester Beatty has removed his New York office to 25 Broad Street, where he will occupy a suite in the offices of Hayden, Stone & Co. Though he will spend several months of each year in the United States, Mr. Beatty has taken up his residence in England on account of his extensive interest in British companies developing and operating mines in Siberia and India. His London office is at 1 London Wall Buildings.

OBITUARY

George Mitchell, who in the early Klondike days made quite a fortune in promoting the White Pass Ry., died recently at Harrison Hot Springs, aged 65. He was a great friend of Sir Wilfrid Laurier and lived in Ottawa much during recent years. Last year he had financed a railway project to build from Taku to Atlin, B. C., but the coming of the war caused his arrangements to fall through.

Thomas William Fitch died in Brooklyn, N. Y., Mar. 8, aged 70 years. He began life in the United States Navy, but retired many years ago and entered the wire business in St. Louis. He remained there for some time, but came to Pittsburgh about 35 years ago. He was one of the founders of the Consolidated Steel & Wire Co., and was general manager of that company, which later became part of the American Steel & Wire Co. Mr. Fitch then organized the Pittsburgh Wire Co. This company also became a portion of the American Steel & Wire Co., and Lieutenant Fitch then helped organize the Pittsburgh Shafting Co., which was purchased later by the Columbia Bridge Co. Lieutenant Fitch was for some time president of the shafting company. He was instrumental in the formation of the Griswold Wire Co. of Braddock and of the Braddock Machine Co. His widow, who was a daughter of General W. T. Sherman, survives him, with two sons and two daughters.

William T. Simpson, first vice-president of the American Rolling Mill Co., Middletown, Ohio, died at his home in Cincinnati, Mar. 31, aged 59 years. He was associated with George M. Verity, president, and R. C. Phillips, secretary, in the organization of the company in 1899, and had been first vice-president from that time until his death. He was a native of Saratoga County, N. Y., and had been actively engaged in the iron and steel business since he was 18 years of age. He was proprietor of the first galvanizing plant established west of the Allegheny Mountains. In 1899, with Mr. Phillips, Mr. Simpson organized the Cincinnati Rolling Mill Co., whose plant was located at Riverside, Ohio. For the past 10 years Mr. Simpson spent practically all his time in looking after the interests of the American Rolling Mill Co.'s plant located at Zanesville, Ohio, and in superintending the development and production of Armco terne plate, to which he paid particular attention.

SOCIETIES

Massachusetts Institute of Technology—The Department of Mining Engineering and Metallurgy has received, through the courtesy of Col. Charles Hayden, '90, a member of the corporation, an interesting addition to its laboratory equipment. This is a complete working unit of the Janney oil flotation apparatus, the machine being fitted with more than the usual adjustments for producing and meeting various conditions. It has an electrical control to enable it to be worked at different speeds and observation windows for noting the interior happenings.

New York Michigan College of Mines Club—An organization of alumni of the above-named institution has been formed with the following officers: William E. Parnall, president; Louis A. Wright, vice-president; James S. Dunstan, secretary-treasurer. The address of the secretary-treasurer is 42 Broadway, New York City. The object of the club is to bring together alumni of the Michigan College of Mines who are located in New York and vicinity or who may be visiting New York. The members plan to meet for luncheon on Friday of each week at Baracca's restaurant, 39 South William St., New York. The presence of all M.C.M. men at these luncheons is desired.

INDUSTRIAL NEWS

The Hecla Mining Co. has recently purchased a 5x6-ft. Chalmers & Williams adjustable quick-discharge tube mill.

Chalmers & Williams has recently sold to the Cusi Mining Co., Chihuahua, Mex., a 5x16-ft. adjustable quick-discharge tube mill.

The first of the 10-ft. Hardinge mills which are going to be installed by the Anaconda Copper Mining Co. were shipped last week from Pittsburgh.

The Burd High Compression Co. announces that its general offices have been moved from the Masonic Temple to 307-309 South Main St., Rockford, Ill.

The Dorr Cyanide Machinery Co. announces that after May 1, 1915, its New York office will be Room 2843, Whitehall Bldg., New York City, instead of 30 Church St.

The Wilson-Snyder Manufacturing Co. and the Wilson-Snyder Centrifugal Pump Co. of Pittsburgh, Penn., have opened a branch office at 52 Vanderbilt Ave., New York, in charge of Mr. A. H. Sherwood.

Chicago Pneumatic Tool Co. announces the removal of two of its branch offices to new quarters as follows: New York office, from 50 Church St. to 52 Vanderbilt Ave. Boston office, from 191 High St. to 185 Pleasant St.

The Denver office of the Sullivan Machinery Co. after May 1 will be located at 837 Equitable Bldg., and it will continue to carry the same stock of repair parts and complete machines at Denver as heretofore. George W. Blackinton is manager.

A manufacturer near New York desires a supply of amorphous silica (either the gelatinous form or dehydrated) such as is produced in analytical operations. Will anyone in nearby territory producing this as a byproduct please advise the editor as to quantity and prices?

The Deister Concentrator Co. announces that about eight weeks ago one of its No. 3 tables was placed in the Colburn Ajax Mill, Victor, Colo., on trial, and after the table had been in operation a short time, an unsolicited order was received for seven more slime tables for immediate delivery; later an additional order came from the mill for four more slime and one sand table.

Alfred Kauffmann is now vice-president of the Link-Belt Co. in charge of operations at Indianapolis. Mr. Kauffmann served in the engineering department at Philadelphia for a number of years, from which he was promoted to take charge of the erection work of the company. He then proceeded to the sales department, looking after the coal mining business in the East, and particularly in the West Virginia field. His many friends in this industry will be glad to learn that in recognition of his competent and able work he has been elected vice-president of the Link-Belt Company.

The introduction of the Oliver filter into the Cœur d'Alene district for dewatering flotation concentrates is creating interest among the mill men of that district. The Oliver filter installed at the Gold Hunter Mill, near Mullan, Idaho, is reducing the lead flotation concentrates to an average of 6.5% moisture, and has so far exceeded expectations that Oliver filters have recently been ordered by the Bunker Hill & Sullivan Co., at Kellogg; Hercules Mining Co., at Burke; and the Consolidated Interstate-Callahan Mining Co., at Wallace. The Inspiration Consolidated Copper Co., of Miami, Ariz., is installing four Oliver filters with a total capacity of 1000 tons per day, and the Anaconda Copper Mining Co. is adding five additional Oliver filter units to the three which have been in operation there for the last year. Those at the Anaconda plant are 11 ft. 6 in. in diameter by 12 ft. face, and have an average capacity of 330 tons each per day.

The Snyder Electric Furnace Co., 53 West Jackson Blvd., Chicago, has closed a contract with the Daimler Motor Car Co. for an electric steel furnace, with a total daily capacity of four tons. This furnace will be operated on a refining basis and will melt cold material. This makes the fifth furnace which the Snyder company has sold in Europe within the last two months. The Daimler Motor Car Co. at the present time, in addition to its well-known line of automobiles and trucks, is manufacturing aëroplanes for the British Government. The steel supplied by the electric furnace just contracted for will be used in the manufacture of castings for aëroplane motors. G. J. Stock, formerly manager of the Stock Oil Fired Convertor Co., has sold out his interest in that company and is now the English representative for the Snyder Electric Furnace Co. His office will be at the Villas, Middleton St. George, Darlington, Durham, England.

At the annual meeting of stockholders, Feb. 18, 1915, it was decided to change the name from the Metallurgic Engineering Co. of Chicago, Ill., to the Snyder Electric Furnace Co. This action was taken because it was felt that the old name did not accurately describe the company's business and was confusing to the public. The company is just completing the installation of a second three-ton furnace for the Otis Elevator Co., Buffalo, N. Y. This furnace will have a basic lining, and will be used in the manufacture of refined-steel castings. The contract for this second furnace was closed nine months after the first one was put in operation. It is expected that the new furnace will be running about the middle of April. The Snyder Electric Furnace Co. is also installing a small furnace for the Niagara Electric Steel Corporation, at North Tonawanda, N. Y. This furnace will be basic lined and will have a daily output of six tons of refined steel. In addition to these two furnaces the Snyder company is just completing the installation of three different electric furnaces to be used in special chemical work.

The Traylor Engineering & Manufacturing Co. of Allentown, Penn., has recently supplied to the Consolidated Interstate-Callahan Mining Co. additional equipment for its mill at Wallace, Idaho. The new equipment includes two sets of Traylor rolls, 30x14-in., fitted with fleeting mechanism; five Traylor all-steel jigs and a short tube mill, 6 ft. in diameter. The Boyd-Smith Mines, of Mineral, Va., has ordered a set of Traylor rolls, 24x12 in., with automatic side adjustment. The Traylor company has also supplied to the General Chemical Co. an 18x30-in. Blake crusher fitted with manganese-steel wearing parts; a 30x48-in. heavy jaw crusher, having cast-steel frame and manganese-steel fittings; a 7x11-in. Dodge crusher, fitted with forged-steel crushing plates. The St. Louis Smelting & Refining Co. has ordered three sets of 42x18-in., extra-heavy, type AA, crushing rolls and an all-steel, 30x60-in., heavy-duty Blake crusher; Mine La Motte, a 30x60-in. heavy-duty crusher. The Traylor company has also sold to the Irvington Smelting & Refining Co. at Irvington, N. J., a crushing plant for handling matte, consisting of a 10x16-in. Blake crusher, screen, elevator and a set of 24x12-in. type A automatic rolls.

The Traylor Engineering & Manufacturing Co., of Allentown, Penn., has recently received a contract from the Granby Consolidated Mining, Smelting & Power Co. for an additional copper-matting furnace for the Anyox plant. The Traylor company furnished the equipment for the original plant at Anyox, including three 56x360-in. blast furnaces. The new furnace is a duplicate of those previously furnished except that it will be 5 ft. higher, this being accomplished by putting in a row of jackets around the top. The Consolidated Mining & Smelting Co. of Canada, Ltd., has ordered from the Traylor company 30 water jackets for its copper smelting furnaces at Trail, B. C. The Balbach Smelting & Refining Co. has purchased a complete set of water jackets for its lead furnaces, and the Tennessee Copper Co. a 56x270-in. furnace fitted with cast-iron superstructure, which was machined to make it air-tight; the Tennessee Copper Co. has also ordered a carload of water jackets, fitted with welded tuyeres and having no riveted or beaded joints on the fire sheets. Phelps, Dodge & Co. has ordered a set of jackets with welded tuyeres for the Detroit Copper Co. The St. Louis Smelting & Refining Co. has purchased a lead blast furnace, 36x126 in., and the General Chemical Co. a 24x118-in. special furnace for its Delaware works.

TRADE CATALOGS

Circular of a new sand and gravel washing device invented by the Biesanz Stone Co., Winona, Minn.

Armstrong Cork Co., Pittsburgh, Penn. Folder. Nonpareil high pressure covering for boilers, etc. Illustrated.

The Deister Concentrator Co., Fort Wayne, Ind. Loose leaf catalog. Ore concentrators. Illus., 6x9½ inches.

Scranton Steam Pump Co., Scranton, Penn. Bulletin No. 101. Duplex piston pumps. 16 pp., illus., 6x9 inches.

Snyder Electric Furnace Co., Chicago, Ill. Bulletin. Electric steel melting furnaces. 24 pp., illus., 8x10½ inches.

Trussed Concrete Steel Co., Youngstown, Ohio. Catalog. Kahn Pressed Steel Bldg. Construction. 20 pp., illus., 11x8½ inches.

The Lagonda Mfg. Co., Springfield, Ohio. Catalog W-1. Lagonda locomotive arch tube cleaners. 12 pp., illus., 6x9 inches.

Marion Steam Shovel Co., Marion, Ohio. Catalog No. 92. "Digging and Mixing Clay—One Operation." 30 pp., illus., 5½x8 inches.

Fort Wayne Electric Works (Rock Drill Dept.), Madison, Wis. Bulletin No. 1143. Electric rock drill, type A. 20 pp., illus., 8½x11 inches.

Steel City Electric Co., Pittsburgh, Penn. Price list of Marchland Clamps and Reproduction of Test Reports Submitted by the Pittsburgh Testing Laboratory.

Sullivan Machinery Co., Chicago, Ill. Bulletin No. 65C. Diamond core drills. 36 pp., Illus., 6x9 in. Bulletin No. 71-A. Air lift pumps. 32 pp., Illus., 6x9 inches.

The Monarch Engineering & Mfg. Co., American Building, Baltimore, Md. Bulletins. Furnaces and forges (oil, gas, coke and coal) for melting, heating, annealing, etc. Illustrated.

Editorial Correspondence

BUTTE—Apr. 8

Every Socialist Candidate Was Defeated and every Democratic candidate was elected at the Butte municipal elections Apr. 5. The result, it is hoped, will usher in an era of prosperity such as Butte has not seen for some time. With the resumption of operations of many of the Anaconda company's and other mines, with the probable increase of miners' wages due to the advanced price of copper, everything points toward a revival of activity not only in the mining industry but in all others that are directly or indirectly affected by it.

Phosphate Mining in Granite County—J. D. Fields of the Royal Basin company at Maxville, in an address made Mar. 31 before the Helena chapter of the American Mining Congress, made the announcement that early in June construction work will start on a plant at Philipsburg and another at Maxville for the production of phosphate fertilizer. The company owns 194 acres of phosphate deposits in Granite County and all arrangements for its exploitation on a commercial basis have been made. Plants will have a capacity of 300 tons a day.

Mining Activity in the Saltese District—Preparations for an active mining season in the Saltese district, Missoula County, are being made and the outlook is good for development of many valuable properties. The territory north of Saltese is largely a gold and galena district. The solving of the transportation problem by the construction of the Milwaukee and N. P. lines has aided materially. Among the most promising properties are the Tarbox mine, situated about 2½ miles north of Saltese on Packer Creek, the Hemlock mine, 1½ miles north of Saltese, the Last Chance mine, 5 miles northwest of Saltese and the Dorr group of mines in the same section. All these mines are carrying on active operations, some of them being heavy and regular shippers.

Options Being Taken on Dredging Ground in Ruby Valley—About a year ago the Oroville Dredging Co. of California did considerable prospecting with Keystone drills in the Ruby Valley near Twin Bridges, after which the prospecting crew departed without making known the results of their operations. Options are being secured again on lands nearly identical with those held under option by the California company. E. W. Cassel, a rancher on lower Wisconsin Creek, which is supposed to be in the dredging belt, has recently sampled ground on his property which assayed 15c. to the cu.yd. at a depth of 8 ft. from the surface. The Conrey Placer company at Ruby, which carries on the largest placer operations in Montana, is known to dredge similar ground at a profit. Wisconsin Creek has its source in the Tobacco Mountains, which abound in quartz ledges, which is considered the mother lode.

Montana Oil and Natural Gas Fields in the eastern and northern parts of the state are being developed rapidly and new companies are being formed to exploit these fields on an extensive basis. Those who have been over the ground in the vicinity of Glendive, Miles City, Billings, the Sweetgrass hills, Havre and Great Falls are confident that in all these sections the gas and oil strikes will be fully as promising as those made across the Canadian line at Medicine Hat and at Bow Island, where some of the largest gas wells in the world have been developed. The topographical and geological features of the Sweetgrass hills in northern Montana seem to indicate that in those hills are the oil reservoirs responsible for the remarkable production of the Canadian wells. Near Havre two gas wells are already producing 1,000,000 and 5,000,000 ft. of gas per day, respectively, which is being piped to the city for commercial purposes.

DENVER—Apr. 7

A Unique Attitude Toward a Corporation is being manifested by Boulder County mining men. Throughout the history of Colorado there has been a determined opposition by ore shippers to any increase in freight rates, but in this instance mine owners and prospectors are advocating an increase. For some years the Denver, Boulder & Western R.R.—otherwise known as the Switzerland Trail of America—has been operating at a loss. This state of affairs became so acute that recently the company announced its decision to cease operating the property and forfeit the franchise. At this juncture, the few shippers in this mountain region, served alone by this picturesque, narrow-gage railway, decided they could ill afford the discontinuance of railroad service, and by personal solicitation secured a general sentiment favoring higher rates which would justify the railroad company in continuing. Accordingly, announcement is made of an advance of appproximately 20% in both passenger and freight rates.

Splitting Up of Former Holdings of Golden Cycle Mining Co. has had the almost paradoxical effect of enhancing the market value of stock in this company as well as of the stock in the Vindicator Consolidated which has just purchased the Golden Cycle mine. President Adolph J. Zang, in a letter to Vindicator stockholders, says: "It is the intention of your board of directors to devote the net earnings from the Golden Cycle mine to the liquidation of notes issued to complete its purchase and, in so doing, it is expected to cancel the final note some months before its maturity. There have been rumors in the press that the Vindicator company would increase its capitalization, also that it would suspend payment of dividends until the entire note issue was canceled. No change in capitalization has been or is contemplated and it is not anticipated that the retirement of the notes will, in any way, affect the payment of the regular quarterly 3% dividends." Golden Cycle stockholders will hold a special meeting to consider changing corporate name to Golden Cycle Mining & Reduction Co. As a publicity stunt, Manager E. F. Smith, of the company's mill at Colorado City, entertained press representatives and other guests with an exhibition clean-up and bullion melt followed by "tiffin." The plant now treats 1100 tons daily at an average milling profit of $2 per ton.

SALT LAKE CITY—Apr. 8

The University of Utah Affairs show little advance toward satisfactory solution or adjustment. At a meeting of the board of regents a motion to remove the president was voted down 10 to 3. Professor Lovejoy of Johns Hopkins University, representing the American Association of University Professors, is here investigating the causes of trouble. The purpose of this professors' society is to investigate conditions at all American universities as to what professors may do in the way of free speech.

George Graham Rice, publisher of the New York "Mining Age," promoter, etc., is in Salt Lake for the purpose of getting information about mining properties in the Alta and Big Cottonwood districts, and incidentally for the purpose of booming these camps. He has been welcomed here by the brokers, but sentiment among mining men is divided, or opposed to a boom of the camps in question, holding that conditions are good enough as they are and that a reaction would follow.

A Utah Chapter of the American Mining Congress was formed at a meeting of mining men held at the Newhouse Hotel on Apr. 5. The purpose of the organization is to enable mining men of the state to act as a unit in matters of especial import to them, such as fighting adverse legislation effecting taxation, labor, smelting, freight rates, and other matters, and to disseminate reliable information relative to Utah's mineral resources and other opportunities for investment in all parts of the state. G. H. Dern, third vice-president of the American Mining Congress, acted as chairman. The congress has taken rooms on the third floor of the Boston Building for its headquarters. Further steps in perfecting the organization will be taken.

Proposed New Town for Bingham District—Much opposition has developed to the attempt to incorporate the new town of Phœnix in the Highland Boy district in upper Carr Fork Cañon. A petition asking for incorporation signed by 49 residents was filed with the county commissioners. The day following most of the signers of the first petition and many others filed a protesting petition, declaring they had signed the first petition under a misunderstanding. It is alleged that the purpose of the proposed incorporation was to reinstate the saloons, closed by the local option election of 1911. The ground included in the proposed incorporation would extend from the Utah Apex mill up to 500 or 600 ft. above the Yampa, and would be about 400 ft. wide along the cañon. The mining companies are opposed to it, because it would increase their taxes without any benefit and would undoubtedly decrease the efficiency of their men. The new law regarding moving liquor into dry territory is more stringent than formerly, as the breweries or shippers are responsible, so that it has not been possible to ship so much

beer into Bingham as heretofore. The principal pro-incorporators are liquor and saloon men. Three hearings have been held on the question before the county commissioners of Salt Lake, and the matter has been taken under advisement. A census may be taken to determine the population of the ground in question.

The San Rafael Oil Field in central Utah, comprising an area in Emery, Wayne and Garfield counties, lying west of the Grand River and south of the Denver & Rio Grande R.R., has been under investigation for about three years and strong interests have acquired control of the most favorable territory. The Des Moines Oil Co., T. A. Harding, president, and the Duquesne Association, organized by W. L. Curry and associates of Pittsburgh, have large areas in the field and after investigation of the geology and conditions have made preparation for drilling. The Des Moines company drilled a well 2910 ft. deep, encountering three oil and oil-and-gas sands but failed, by reason of the light rig used, to reach the big sand, 300 ft. thick, which is calculated to be about 3600 ft. deep here. The Mount Vernon company also drilled a deep well about six miles southwest of the Des Moines hole but did not reach the big sand. The upper sands cut in these holes were not tested for oil but are reported to have possibilities. Plans for further drilling are under way. The strata of the field are exposed to a depth of from 2000 to 5000 ft. in adjacent cañons. The survey of the Southwestern Pacific R.R., a projected new line from Denver to Los Angeles, runs diagonally through the field.

The New Plant of the Hercules Powder Co. at Bacchus, Utah, has been completed, and was formerly opened Mar. 29, when it was visited by a party of 175 mining and business men as guests of the company. The plant was inspected and the various processes in the manufacture of high explosives and black powder were shown. Members of the party, who registered at the office, were relieved of matches preparatory to going through the works. The sodium-nitrate storage house and the drying house for wood pulp were first visited; then the nitric-acid plant, where the acid is made from sodium nitrate and sulphuric acid; next the ammonium-nitrate plant; the sulphuric-acid plant, where acid is manufactured from pyrite by the contact process, the pyrite being obtained from Bingham. Some distance from these is the building where the acids and glycerin are weighed and mixed, the nitroglycerin being taken in a rubber-tired wagon to a building where it is incorporated with the base, for gelatin powder. The mixing is done in a machine made largely of phosphor-bronze. A similar process for mixing the nitroglycerin with wood pulp, etc., for regular dynamite, in a kind of chilean mill with rubber-tired rolls is carried on in another building. Lunch was taken at the club at Bacchus, followed by a speech by Governor Spry, welcoming the Hercules Powder Co. to Utah, and calling attention to the policy of the state to encourage the investment of capital. J. T. Skelly spoke for the company, mentioning the care taken of the employees, whom it encouraged to become stockholders. He said that stock awards were made for inventions, improvements, etc., around the works. After lunch the section of the plant where black powder is manufactured was visited. The black-powder section is in a gulch, where natural protection in case of explosion is afforded, no artificial embankments of earth, such as used around the buildings in the dynamite section, being necessary. The plant covers 2280 acres, and is the most modern of the company. To start with, the working forces consist of 95 men, taken from other plants of the company. The capacity of the plant is 1,250,000 to 1,500,000 lb. dynamite a month, and 500 kegs of black powder per day. Bacchus is on the west bench of the valley, 20 miles from Salt Lake City, and 13.5 from Bingham—elevation 4899 ft. The town has 38 modern houses, a club run by the employees, hotel, store, etc. These are a mile from the main works. Stanley B. Moore, from Hercules, Calif., will be the superintendent.

SEATTLE—Apr. 6

The Earliest Thaw in the history of the Yukon is now under way. The winter trails are fast going to pieces, dredges are preparing for summer work, and Dawson and the entire surrounding country has more men than can obtain employment.

A New Dredging Field will be opened this summer in the Six Mile Creek district near Seward by the Sunrise Dredging Co., which is now having constructed in Seattle by the American Dredge Building & Construction Co. a 2-ft. bucket, double-flume, screen dredge, which will be placed on the ground in June. The claims which are owned by Charles E. Herron and Dr. P. T. Barnes were opened last summer with a Keystone drill and good pay found. The district was first opened up about 18 years ago and yielded more than $1,000,000 in gold won by wing damming the stream. Because of the thawed condition of the ground and the heavy flow of water it was impossible to work the bed gravel or islands in the creek. The only gold taken out was that found on the high rimrocks. In the country contiguous to Seward there is an immense area of low-grade placer ground which will yield big profits if operated by labor-saving devices, and the dredge to be installed this summer, it is believed, will be the forerunner of a large number of these machines. Kenai River, which is about 50 miles long and very wide, for many years past has been producing grubstakes for miners operating with sluice-boxes and some satisfactory cleanups have been made with a hydraulic plant.

LOVELOCK, NEV.—Apr. 8

The New Gold Strike nine miles east of Lovelock has aroused considerable excitement. The ore is gold quartz in a ledge about 40 ft. wide. The find is in a gulch and no depth has as yet been attained. The outcropping ledge is being sacked for shipment, most of it showing free gold. The discovery claim was sold a few days ago for $2000. The day of this correspondence, 15 or 18 automobiles with from two to seven people each have visited the camp. All comments are favorable and considerable activity is expected. The camp, which has been named Willard, after the little white hope champion, is five miles from the Southern Pacific and four miles from the electric power line between Hazen and Rochester. There is no water nearer the camp than the Humboldt River, which is six miles distant.

PATAGONIA, ARIZ.—Apr. 5

An Interesting Reminder of Former Days is a bar of lead from an old smeltery, plowed up in a field below the Mowry wash. It is marked S. M. and is supposed to have been smelted by Sylvester Mowry during war times. The United States Government finally seized the mine upon suspicion that it was supplying the Confederacy with lead. The bar, which weighed about 50 lb., has not yet been assayed but it is thought that it carries considerable silver. Another reminder of former days, is the visit of Raphael Pumpelly to the scenes of his early activity when chemist of the Santa Rita Co. He came out with his children to show them, he said, where he had his well known adventures in the Apache days. The old hacienda can still be traced by the walls of adobe standing on Magee Creek. One of the old mines worked by the Santa Rita Co., now called the Mills, is located just above the old buildings and had fabulous values in silver. Just now the whole neighborhood is tied up in the Baca litigation, and there is nothing being done with any of the mines.

JOPLIN—Apr. 9

It Is Rumored Here that a "Press Bureau" is in process of formation by a number of mine promoters. Investors who may be tempted by the present high price of zinc should take warning.

TORONTO—Apr. 10

The Nickel Question came up again in the Canadian Parliament on Apr. 3, when the Government was asked what action would be taken in view of the numerous petitions sent in asking that the refining of nickel should be done in Canada. The reply of Sir George Foster, Minister of Trade and Commerce, though nonofficial, was taken to indicate decisively that nothing would be done in the matter. He stated that while the Government had a large interest in the question, it had reached no conclusion either as to prohibiting the export of matte or undertaking the refining of nickel, which would involve many questions respecting the necessary capital and equipment. The matter may be regarded as finally set at rest so far as any action on the part of the Canadian Government is concerned.

Rumors Regarding a Dividend on Dome Stock have been quieted by the semiofficial statement that no such move is contemplated at the present time. Recent developments on the sixth or 544-ft. level have been very encouraging and the diamond drill has cut a horizontal section 157 ft. wide that assays $16.48 a ton. This is the greatest width of any such grade of ore that has been found in the mine below the 100-ft. level. Much work remains to be done on this property before the present plans now under way are completed. The capacity of the mill is to be raised from 23,000 to 28,000 tons a month. Underground electric haulage is being installed, and a large crushing plant is being put in on the 544-ft. level. At present the greater portion of the ore comes from the glory holes, so that the returns from the higher grade ores on the bottom levels will not be felt for some time to come. The cash in the treasury amounts to about $350,000, and there is some talk of issuing 50,000 of the treasury shares at par. In this event the cash would be used to finance additional development, and for further increasing the capacity of the mill.

The Mining News

ALASKA

JAY LIVENGOOD, who made gold discovery on Livengood Creek which started stampede, has sold interest in eight claims to David Cascaden for $40,000. Cascaden has been investigating property for past three months and finds that values run $3 per foot.

RAMBLER GOLD MINING (Valdez)—Has been taken in charge by U. S. Marshal on writ of attachment. Most of claims which amount to $2293 are for labor.

PATSY & BAY VIEW (Valdez)—Driving tunnel on ledge 25 to 30 ft. wide with 7 ft. of gold ore that will average $27.50 per ton. Dunk Stewart is superintendent.

YUKON GOLD (Dawson)—Is stated will acquire all Treadwell concessions here on account of financial difficulties latter find themselves in. Labor liens and other indebtedness amount to about $100,000.

ALASKA JUNEAU (Juneau)—During past 18 years 30-stamp mill has handled 295,807 tons ore from selected surface workings yielded $2.26 free gold per ton. Ore was sorted and about 37% rejected. December run-of-mine ore, 7652 tons, averaged $1.66; January run-of-mine, 7900 tons, averaged $1.56 per ton.

ARIZONA

Gila County

OLD DOMINION (Globe)—After shut-down since Mar. 5 on account of partial flooding of mine from unusual rainfall, operations have been resumed. Concentrator and smeltery also started.

INSPIRATION (Miami)—Copper production will begin in new combination water-concentration and oil-flotation mill in June. Mill will have 18 sections, each with capacity of 800 tons daily. First nine sections almost complete; second nine will be ready by end of year.

MIAMI (Miami)—Five sections of mill in operation though not up to capacity. Sixth section has been altered according to plans to get better results. Fifth section changed some months ago with resulting gain of two pounds more copper per ton will be further altered to conform to latest plans. Work on all sections to be pushed to bring production up to 50,000,000 lb. copper per year.

Mohave County

GOLD REED M. & M. (Oatman)—New head frame is being erected. Hoist is to be installed.

ARIZONA SOUTHWESTERN COPPER (Yucca)—Work on this property to be resumed at early date.

CARTER GOLD (Oatman)—Company is negotiating for an air compressor and drills. It is intention of company to continue sinking shaft.

RAINBOW MOUNTAIN (Chloride)—Is getting ready for shipments of ore. Large tonnage of high-grade smelting ore is in sight. Mineral content is chiefly lead.

TYRO (Union Pass District)—Orebody exposed by crosscuts from shaft average 30 ft. in width, of good milling grade. Company is negotiating for full equipment of mining machinery to enable it to sink to 500 feet.

WALNUT CREEK M. & M. CO.—This property in Maynard District, in Wallapai Mountains includes old Pride of the Pines Claim, site of probably the first discovery of ore in this district about middle of last century. Work is to be resumed at an early date. Property under management of George E. Worton.

Yavapai County

SUNRISE (Prescott)—Sunrise mine in Hassayampa district has been reopened after long idleness.

CROOK CAÑON (Turkey)—James Shaers and J. H. Cross are operating arastres on their property. Theising & Schultz are also operating one at Turkey Creek.

EUREKA (Walker)—During last 60 days Eureka and Fortune mines have shipped 240 tons of ore to Poland mill. From Eureka, shipments of high-grade are made to Douglas smeltery.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Preparations being made for installation of new 40-stamp mill, notwithstanding appeal of Kennedy Extension Gold Mining Co. from decision of Court in favor of Argonaut in apex suit.

Butte County

P. B. STEIFER MINING (Oroville)—Superior Court granted injunction restraining directors from selling stock for nonpayment of assessments. Directors are charged with having sold stock to amount of $400,000 and to have mined only $1700 worth of ore since 1901. Stockholders want to know.

Kern County

GOLD PEAK (Caliente)—A. T. Copley representing southern California men is reported to have taken over this property in Amalie district. Stamp mill is being installed.

Madera County

ENTERPRISE (Grub Gulch)—Preparations are being made to resume mining. Installation of new machinery is contemplated.

TEXAS FLAT (Coarsegold)—New electric power line, part of San Joaquin Light & Power Corporation system, nearing completion. Mining operators have put in poles; wire is on ground ready for stringing. Power company will make connections. Effort will be made to extend line into Grub Gulch district.

Nevada County

RAGON FLAT (Nevada City)—New electric hoist is nearing completion. Electric power line has been built to mine. Old inclined shaft is being repaired and pumping will begin as soon as installation is complete.

Placer County

GARDELLA DREDGE (Auburn)—Dredge completed and given first trial run. Lawrence Gardella who operates dredges at Oroville is owner and contemplates putting dredged land in condition for planting oranges.

Shasta County

MAMMOTH (Kennett)—Supplies are being taken to Spread Eagle in preparation for extensive development. John Muir is superintendent of this newly acquired property.

LITTLE NELLIE (Kennett)—Large body of copper ore recently encountered has induced owners of Pittsburgh-Mt. Shasta Gold Mining Co. to consider installation of treatment plant. Property formerly worked as gold mine is equipped with 15-stamp mill. Concentrates were shipped to Martinez.

Sierra County

NORTH FORK (Forest)—After exhaustive examination by Blue Sky Commission, permission has been granted to company to sell sufficient stock to develop and equip this mine.

TWENTY-ONE & RAINBOW (Alleghany)—Companies have been consolidated and new organization is preparing to work both mines on large scale. Will install 20-stamp mill. D. W. Mitchell, manager of Twenty-one, will continue under consolidation.

PLUMBAGO (Alleghany)—New building to house 20 stamps to be built to replace plant recently burned, although but 10 stamps will be installed at present. Plumbago has been rich and steady producer for over 20 years and is now owned and operated by Croesus Gold Mining Co. W. B. Pearson is superintendent.

Siskiyou County

McKEEN (Callahan)—Making preparations to install 20-stamp mill.

Tuolumne County

BLACK OAK MINES & MILLING CO. vs. JOHN B. CURTIN. Suit brought in U. S. District Court for $13,715 to satisfy balance claim of creditor and for accounting of $227,500 purchase price of Black Oak mine at Soulsbyville. Curtin was agent in transfer of property and present owners allege that he did not make strict accounting. Curtin Democratic candidate for governor in 1914 election.

TARANTULA (Jacksonville)—Property purchased by Henry T. Gage, former governor of California, from United Gold Mining & Milling Co. of Paris. The purchase price said to be $12,000, of which one half is paid. Balance in six months.

COLORADO

El Paso County

GOLDEN CYCLE MILL (Colorado City)—Made a new monthly record during March, producing bullion worth approximately $1,305,000, from Cripple Creek ores, representing treatment of 29,000 tons of ore, according to figures made public by E. F. Smith, mill manager, who claims, also, that the mill treated 70% of district's production during that month. This plant is purchasing high grades of ore that have heretofore been treated exclusively by smelteries, the Cresson ore being among those successfully treated thus far by roasting and cyaniding.

Teller County

CRIPPLE CREEK PRODUCTION for March heaviest for years amounting to 77,618 tons, estimated value $1,986,493. Producers were: Golden Cycle, 29,000; Portland, 10,000; Smelters, 5200; Portland (C. C. District), 16,100; Stratton's Independence, 9668; Colb. Ajax, 4300; Neville Free Coinage, 2000; Kav. Jo Dandy, 1000; Wild Horse, 350 tons.

DANTE MILL (Cripple Creek)—After a four-months' shutdown for repairs and improvements mill is again in service treating $5 ore.

JERRY JOHNSON (Cripple Creek)—This mine on Ironclad Hill being equipped with new 100-ton cyanide mill, expected to be complete in 60 days.

IDAHO

Lemhi County

PITTSBURGH-IDAHO (Gilmore)—Thirty leasers and 28 men company account operating property. More leases will be let.

Shoshone County

AMY & MATCHLESS (Wardner)—Erection of 50-ton mill will soon be under way, mill to be running in early summer. Gus Smith is principal owner and manager.

INTERSTATE-CALLAHAN (Wallace)—Has let a contract for construction of 10,500-ft. aërial tram from its mill to Sunset station, on Nine-Mile branch of Northern Pacific Railway. Expected carrier will be completed and ready to operate not later than May 15. This tram will be longest in Cœur d'Alenes, and third longest in West.

MICHIGAN

Iron

BRISTOL (Crystal Falls)—Order will be placed shortly for new 2500-ft. compressor for this mine.

OLIVER IRON MINING CO. (Escanaba)—Crushing plant will be started within next 10 days.

CARPENTER (Crystal Falls)—This is first mine in Michigan to ship ore this year. Several trainloads sent to Escanaba docks this week. Carpenter is new mine operated by M. A. Hanna company.

CHASE (Ishpeming)—Ore at this place about worked out and mine will be closed sometime in May. Exploratory work has been done in region of Chase and Dexter mines by Cleveland-Cliffs Iron Co. but nothing of value has been revealed.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—Diamond drill set up on ice on North Lake close to North Lake mines of company. Piles have been driven through ice and into lake bottom. Body of hematite known to underlie lake, but further testing is thought advisable. Two drills now at work short distance to west of lake on lands of Barnes Land Co. Water in lake will probably be pumped out within next few years.

MINNESOTA

Duluth

ZENITH FURNACE CO. (Duluth)—Arrangements now being made to manufacture benzol as byproduct from their coke ovens.

MINNESOTA STEEL CO. (Duluth)—Construction work on Steel Corporation's plant at Duluth will be resumed immediately. Last fall all construction was stopped, although 150 men were kept at repair and maintenance work throughout winter. Resumption on steel plant will also mean resumption on Universal Portland Cement Co.'s plant at same place.

Cuyuna Range

CAVOUR (Kinney)—After four years of shipping, much of which has been unprofitable, mine is now being dismantled and will be abandoned.

ROBERTSON-KINGSTON (Virginia)—Two shovels will be started in few days. This independent operation shipped large tonnage last year.

INLAND STEEL (Brainerd)—Will build experimental concentrator near Ironton and Crosby to serve its Armour No. 1 pit mine, Armour No. 2 underground, and Thompson pit mine. Contracted for 70 hp. electric current from Cuyuna Range Power Co.

Mesabi Range

DUNWOODY (Chisholm)—One shovel was started here Apr. 1. About 100 men are employed. Considerable overburden to be removed. Some ore may be shipped before close of season. Stripping stopped first of year when cold weather set in.

HIBBING—Several electric shovels have made their appearance and will soon be at work in pits. Electric shovels are new in Minnesota. Frank Armstrong, master mechanic for Penn Iron Mining Co. in Michigan, has been experimenting with an electric shovel for two years at Vulcan on Menominee range. He has not made known the results.

MOHAWK (Aurora)—Pumps being pulled from mine, indicating no contemplated activity this season. Many improvements have been made to surface plant in late months, including new shaft house. Mine has large stockpile, which it is assumed will meet all requirements for Mohawk ore during the coming season.

MISSOURI

Jasper County

MAGNET (Carthage)—Stone & Printz reported to be about to build 200-ton mill on Magnet lease, six miles southeast of Carthage.

MONTANA

Beaverhead County

BANNOCK CONSOLIDATED (Bannock)—Consisting of 17 claims bought by J. F. Cowan of the Columbus Extension, Salt Lake, and B. Binnard of Butte. Active development will be begun immediately.

Deer Lodge County

HIDDEN LAKE MINE (Georgetown)—Stockholders of this property have given 90-day option on property to Boston capitalists, whose action will be determined by report of J. A. Shoemaker, of Butte, who went to mine to make examination. Property one of most promising in Georgetown district.

Fergus County

BARNES-KING DEVELOPMENT (Kendall)—During the month of March, North Mocassin mine of this company produced and milled 4807 tons of ore. The resulting bullion cleanup amounted to 3060.8 oz., which should return approximately $55,000. Yield per ton of ore, $11.44.

Silver Bow County

BUTTE & SUPERIOR (Butte)—Output of Black Rock mine and mill treating this output broke all its records during the month of March, averaging 1345 tons per day.

ANACONDA (Butte)—March output was 19,000,000 lb. of copper. Company operated at about 70% of capacity. April showing is expected to be about 85% of normal capacity, with starting up of four additional mines and resuming work at Great Falls smeltery.

ANACONDA VS. PILOT-BUTTE (Butte)—On Apr. 5 Judge Lynch granted motion for leave to amend complaint. An exception was taken by Pilot-Butte. Amendment was to cover additional ground developed since original restraining order was issued in October, 1913, and is to embrace new lines within which Pilot-Butte may not conduct operations pending final decision of merits of dispute as to ownership of vein below 1800 level of Pilot-Butte. Anaconda claims it is part of Emily vein. Pilot-Butte claims it is separate vein within its own grounds. Recently the Pilot-Butte was declared in contempt of court for violating first restraining order.

NEVADA

Clark County

WHALE (Goodsprings)—Compressor and other equipment being installed; production of good-grade zinc ore will start in short time. Considerable activity in Goodsprings district, 11 properties producing and much development work under way.

Elko County

CLOVER MINING CO. (Wells)—Group of five claims, 30 miles south of Wells, operated by lessees, making regular shipments good-grade zinc ore.

BLUSTER CONSOLIDATED (Jarbridge)—Built a sawmill during winter and got out timbers for 10-stamp mill now being erected. Considerable tonnage of $12 to $15 ore blocked out.

Esmeralda County

NEW EMPIRE GOLDFIELD MINES (Goldfield)—Corporation formed to develop property of Old Empire Mining Co., adjoining Blue Bull, Lone Star and Commonwealth groups. Will install 40-hp. electric hoist at 150-ft. shaft and continue sinking to 400- or 500-ft. level.

GOLDFIELD COMMONWEALTH (Goldfield)—Control acquired by California men. Property consists of 130 acres, patented, in southeast part of district adjoining Lone Star and Merger groups. Main shaft, 410 ft. deep, equipped with 50-hp. electric hoist; sinking will commence at once.

Humboldt County

GLASGOW & WESTERN (Winnemucca) — Leaching plant 200 tons daily capacity contemplated at old mill site.

BUCKSKIN-NATIONAL GOLD MINES (National)—Lease on block adjoining company workings let to Dunn and Staunton, of Winnemucca. Crosscut tunnel will be driven 800 ft. to cut vein at depth of 400 ft.

ROCHESTER MINES CO. (Rochester)—New stamp mill, recently put into operation, equipped with ten 1550-lb. stamps, two tube mills, five agitators and five continuous-decantation tanks. Crushing is done in solution; precipitation on zinc shavings.

Lander County

PLACER MINING IN IRON CAÑON, near Battle Mountain, is under way. Some coarse gold found.

SECOND PLACER CHANNEL ON WILLOW CREEK, near Battle Mountain, discovered recently. Channel is 30 ft. below surface and 26 ft. below upper channel. Channels are not parallel.

Lincoln County

PIOCHE ORE SHIPMENTS for week ended Mar. 27 were 86 cars; about 4300 tons, estimated value $43,000. This compares with 80 cars the week previous and 84 cars two weeks previous.

PRINCE CONSOLIDATED (Pioche)—During March 15,385 tons of ore shipped to Salt Lake smeltery.

Nye County

TONOPAH ORE PRODUCTION for week ended Apr. 3 was 10,117 tons, estimated value $208,066, as follows: Tonopah Belmont, 2830; Tonopah Mining, 2950; Tonopah Extension, 1700; West End, 1129; Jim Butler, 1100; Tonopah Merger, 150; North Star, 50; and Halifax, 208 tons.

TONOPAH BELMONT (Tonopah)—Shipment 131,535 oz. bullion valued at $93,000 made from mill clean-up for first half March.

MONTANA TONOPAH (Tonopah)—Oreshoot, believed to be in Martha vein, cut on 390-ft. level; 2½ ft. wide assaying $25 per ton.

BIG PINE (Manhattan)—Lessees with crew of 24 producing 375 tons ore per day from glory hole and one stope on 200-ft. level. Ore crushed, tube-milled and all slime plated. Tailings average 40c. and are stacked. Daily consumption of tube-mill pebbles from local quarry 170 lb. Dynamite used per day 75 lb. Total cost mining and milling 45c. per ton.

Storey County

C. & C. (Virginia City)—Transformer burned on 2500-ft. level. Fortunately timbers did not ignite.

NORTH END COMSTOCKS (Virginia City)—Electric pumps expected to operate Apr. 15 and complete unwatering 2700 level to be effected Apr. 18.

CONSOLIDATED VIRGINIA (Virginia City)—Raising and sinking under way in oreshoot recently opened on 2500-ft. level. Ore assays $7 per ton.

Washoe County

RED METALS CO. (Reno)—This copper property on Peavine Mountain acquired by Charles B. Bills, president, Pioneer Fruit Co., Sacramento, Calif. Large installation machinery being made; leaching plant may be built.

White Pine County

CONSOLIDATED COPPERMINES (Ely)—Has resumed production from Ora claim of Giroux at entrance to Liberty pit of Nevada Consolidated. Latter company does steamshoveling at no expense to Giroux which pays freight and treatment charges.

NEVADA CONSOLIDATED (Ely)—Operations on Ruth mine will be resumed; no work done since 1907. Ore will be mined by caving system and hoisted through Star Pointer shaft. Considerable repair work necessary; small force now employed. Expected production will commence in 60 days. William Spencer from Bingham will be superintendent.

UTAH

Juab County

TINTIC ORE PRODUCTION for March was 356 cars, or 17,800 tons, estimated at $450,000. This is compared with 297 cars in February and 430 cars in January. Shippers were: Centennial-Eureka, 80; Iron Blossom, 71; Chief Consolidated, 50; Eagle & Blue Bell, 34; Lower Mammoth, 17; May Day, 16; Gemini, 13; Dragon Consolidated, 12; Grand Central, 9; Victoria, 6; Bullion Beck, 6; Sioux and dump, 6; Colorado, 5; Gold Chain, 5; Beck Tunnel, 4; Uncle Sam, 4; Yankee Consolidated, 3; Dubuc dump, 3; Eureka Hill, 3; Opohongo, 2; Carisa lease, 2; Godiva, 2; Ridge & Valley, 1; Minnie Moore lease, 1; Clift lease, 1 car.

TINTIC DELMAR (Eureka)—An 18-in. vein of iron and quartz is exposed in a winze from the tunnel level.

EAGLE & BLUE BELL (Eureka)—A full face of silver-lead ore has been opened in new ground in a drift south from the 1700-ft. level.

CENTRAL HILL (Eureka)—Work is to be done at this property on Godiva Mountain, from 400-ft. level of Grand Central. C. E. Loose and associates are interested.

KNIGHT-CHRISTENSEN MILL (Silver City)—Spark from drier started fire in oil room, causing destruction of mill. Total loss, $75,000 to $100,000; no insurance. Expected new mill will be built.

BULLION BECK (Eureka)—Goodwin, Watkins & Anderson, recently operating jigging plant at Uncle Sam, have taken lease on old Bullion Beck dumps. Four jigs are being installed.

CHIEF CONSOLIDATED (Eureka)—Development work on 1800-ft. has opened ore chute, from which part of the mine's output is coming. Diamond drilling has opened bodies of quartz, which will be further prospected.

LOWER MAMMOTH (Mammoth)—Zinc ore is being broken between the 1500- and 1800-ft. levels. Promising ground south from the 1000-ft. level is being developed on company account. A night shift has been added. Eight sets of lessees are working. A car of ore per day is being shipped.

MAY DAY (Eureka)—March output amounted to 26 cars, and since Mar. 10 production has exceeded car of ore daily. Zinc ore is being shipped by leasers, and company is mining silver-lead ore from western part of property. Annual report for year ended Mar. 31 shows 1785 tons of lead ore, valued at $60,088; and 446 tons of zinc ore valued at $4342; and 1313 tons of lead ore, valued at $27,065, from lease on Chief Consolidated ground to have been shipped.

Piute County

WEDGE (Marysvale)—Shipment of high-grade gold ore has been made from this property in Ohio district. Ore occurs in lenses up to 1½ ft. thick, along hanging wall of quartz vein, 5 to 8 ft. thick. Formation is rhyolite cut by porphyry dikes.

Salt Lake County

UTAH CONSOLIDATED (Bingham)—Earned last year $1.81 per share compared to $2.12 year previous. Mined 153,345 tons copper ore and 48,492 tons lead ore. Present ore reserves, slightly less than a year ago, 256,521 tons ore averaging 1.9% Cu, and 50,365 tons averaging 16.48% lead.

Summit County

PARK CITY PRODUCTION for March was 8182 tons of crude ore and concentrates estimated at $320,000, compared with 7859 tons valued at $313,000, for January and 8517 tons, valued at $338,000 for February. The totals for the leading producers were: Silver King Coalition, 3789; Daly West, 1660; Daly-Judge, 1655; Silver King Consolidated, 728; Daly, 50; others (estimated), 300 tons.

SNAKE CREEK TUNNEL (Park City)—Breast is now approximately 11,000 ft. from portal. Yet 3000 ft. to be driven to complete contract, after which contract for another mile will be let.

WASHINGTON

Pierce County

TACOMA SMELTING (Tacoma)—Safety methods being taught foreign employees by photographs. Hereafter when an accident occurs it will be pictured with workman posing as when hurt and with another pose showing him as he should have been. These pictures 10x12 in. are being framed in plain black frames and posted at the plant.

Spokane County

LAKE CREEK PLACER MINING (Spokane)—Has been organized to work placer deposits in northern Idaho. Operations will begin as soon as melting snow provides sufficient water. Concern is capitalized for 500,000 shares at $1, and has acquired 800 acres of dredging and hydraulic ground between the old camps of Florence and Warrens, in Idaho County.

Stevens County

SCOTIA, on the east side of Kettle River between Marcus and Orient, will be opened and worked this spring. A 2500-ft. tramway is to be erected connecting the mine with Great Northern tracks. Ore, high in copper, will be shipped to Granby smeltery.

OLD DOMINION (Colville)—An appropriation of $25,000 has been made for reopening and timbering mine on Dominion Mountain, which has a rich silver-lead orebody, said to have produced more than $1,000,000 in last 30 years, of which $650,000 has been put back in development. Mine has 17,000 ft. of underground workings. W. H. Linney of Spokane is president.

Whatcom County

GREAT EXCELSIOR (Glacier)—Fred J. Wood and Frank Wright, Bellingham, Wash., have acquired control of Hammond Mining Co., owner of Great Excelsior mine, and are reported to intend installing cyanide plant.

WISCONSIN

Grant County

ALDERSON (Platteville)—Kistler & Stephens struck 2-ft. sheet of jack in drifting toward East End extension.

BIRDBECK (Days Siding)—H. S. Snow and others made valuable discovery of zinc ore in several drill holes at Days Siding.

WEIGLE (Platteville)—Spies & Habel drilled through 3 ft. of rich jack ground on Weigle land just west of the Klar-Piquett mine.

WISCONSIN ZINC (Platteville)—Company is opening up East End Extension and will install an aerial tram to connect with East End mill.

KLAR PIQUETT (Platteville)—Operations have been resumed after year's shutdown; 500 tons of concentrates stored in bin are being roasted at Homestead.

HARRIS-MURPHY (Big Patch)—J. M. Nelson and others of Davenport, Ia., have commenced shaft sinking at Big Patch where 400 acres were recently sub-leased.

WEST HILL (Platteville)—This new producer paid its first dividend of 20% on capital stock of $20,000. Last three cars of raw concentrates assayed 57% zinc.

Iowa County

B. M. & B (Mifflin)—Company has completed milling plant on Biddick land.

Lafayette County

KITTO (Benton)—Vinegar Hill Zinc Co. has sunk shaft and erected mill on this new property.

CANADA

British Columbia

BRITISH COLUMBIA COPPER (Greenwood)—Is to resume to take advantage of better copper prices. Considering a new mill 1000 tons daily capacity.

GRANBY (Grand Forks)—During March 72,242 tons of ore were smelted at Grand Forks compared with 52,500 tons during February. Of the total Granby employees 39% are English speaking, 22% are Scandinavians and 20% are Austrians.

BLUEBIRD (Rossland)—E. L. Tate and Roy H. Clarke of Spokane have been inspecting the Bluebird mine owned by Rosalia Mining Co., from directorate of which Mr. Tate recently resigned in order to be in position to take up working option on property.

RAMBLER-CARIBOO (Three Forks)—It is announced by superintendent that 3 ft. of ore, assaying 268 oz. in silver and 65% lead, has been encountered in the 900-ft. level. The strike is said to be a new shoot, presence of which was unsuspected.

Ontario

SHAMROCK (Cobalt)—Will be reopened.

NIPISSING (Cobalt)—Mills have been closed down owing to shortage of power.

PEARL LAKE—(Porcupine)—This company has made an assignment to G. T. Clarkson, of Toronto.

PORCUPINE IMPERIAL—Compressor plant has been purchased and development will be proceeded with at once.

PORCUPINE CROWN (Porcupine)—Running at 50% capacity on account of power shortage. Production for March about $50,000.

McKINLEY-DARRAGH (Cobalt) — Annual report shows $53,515 spent on Jupiter property in Porcupine, under option to McKinley-Darragh.

APEX (South Porcupine)—A. M. Bilsky, one of directors, states that affairs of this company are to be reorganized and plan for refinancing prepared.

CHAMBERS-FERLAND (Cobalt)—Shareholders will fight proposed transfer of shares in Chambers-Ferland for shares in Aladdin, an English company.

JUPITER (Porcupine)—At annual meeting of McKinley-Darragh held recently question of taking up Jupiter option again was not mentioned.

MIRACLE (Porcupine)—New mill has started and is treating 40 tons per day. If results are satisfactory, capacity will be increased to 150 tons per day.

REA (Porcupine)—High-grade orebody discovered by diamond-drilling is stated to be 10 ft. wide. More holes are being drilled and crosscut will be run to it.

McINTYRE (Porcupine)—Officially stated that diamond drill operating from 400-ft. level of shaft No. 5 has cut the vein 100 ft. below and shows 12 ft. of good ore.

VIPOND (Porcupine)—New orebody opened up for 125 ft. In places through which the crosscut has been driven the deposit is 15 ft. wide and higher grade than shown in other veins.

BEAVER (Cobalt)—In 1914 mined 908,000 oz. of silver and sold 390,000 oz.; balance being held for higher prices. This is record year's production for the company. Ore reserves total 1,200,000 ounces.

COBALT LAKE—Electric pumps which are to be used in de-watering Cobalt Lake are now in position and only waiting for supply of power. Volume of water to be drained into Lake Timiskaming estimated at 800,00,000 gallons. Work will occupy greater part of this summer.

CANADIAN MINING & EXPLORATION—Annual report of President Ambrose Monell states large number of investigations made of properties in Canada, United States and Cuba but no purchases effected though several properties considered had merit and would have justified exploitation under favorable terms.

The Market Report

METAL MARKETS

NEW YORK—April 14

Copper was remarkably stronger upon fairly large transactions. Tin continued to be as erratic as in previous weeks. Lead turned a shade easier following the recession in the London market. The extraordinary situation in spelter continues unabated.

Copper, Tin, Lead and Zinc

Copper—The market rose sharply upon fairly large transactions, which for the major part were with domestic manufacturers, but also for the major part were supposed to be destined for military consumption in Europe. However, there were some further signs of increased buying for domestic peaceful purposes. On Apr. 13, the market had reached a basis of Apr. 14, there were still sellers in quantity at that price, but by the end of the day the market was firmly established on the basis of 16½c., regular terms. Sporadic sales of copper for delivery to out-of-the-way places have been made at fancy prices; fancy prices also have been realized on special brands of Lake copper.

Copper exports from the United States for the week ended Mar. 27 are reported by the Bureau of Commerce at 22,503,362 lb. The chief items were 6,571,652 lb. to Italy, 6,270,771 lb. to Great Britain, 4,822,991 lb. to Sweden, 3,767,021 lb. to France and 770,585 lb. to Norway. Imports were 2,835,229 lb. metal and 272,633 lb. in ore and matte; 3,107,862 lb. in all, chiefly from Peru.

Exports for the week ended April 3 are reported at 10,623,248 lb., chiefly to Great Britain and France. Imports were 404,539 lb. metal and 541,742 lb. in ore and matte.

Copper Sheets base price was advanced ¼c. per lb. on Apr. 8 and on Apr. 13 another ¼c., and is now 21¼c. per lb. for hot rolled and 22¼c. for cold rolled. Usual extras charged and higher prices for small quantities. Copper wire is 17⅛@17⅜c. per lb., carload lots at mill.

Brass Prices were advanced about ½c. per lb. Apr. 8, the base prices being as follows: Sheets, high brass, 18⅝c. net per lb.; low brass, 19⅞c. Wire, high brass, 18⅜c.; low brass, 19⅞c. Rods, high brass, 18⅜c.; low brass, 20⅝c. Tubes, 22¼c. both brazed and open seam. Angles and channels, 22¼c. Scrap allowances, 13½c. net per lb. for high brass; 13⅞c. for low brass.

Tin—This market continued to be erratic, fluctuating sharply from day to day on trifling business. The total for the week was estimated to have been but little more than 100 tons. The new British regulations governing the shipment of tin hither have excited considerable discussion. Tin coming here must be, in the first instance, consigned to the British Consul, following which buyers have to comply with a variety of regulations, some of which are considered to be unworkable. Conferences respecting modifications of these are being held.

Lead—But little business was reported, the recession in London having cut off buying for export, following which independent producers turned sellers at the price of the A. S. & R. Company.

Exports of lead for the two months ended Feb. 28 continue to show the same increase that was noted in the second half of last year.

Spelter—Substantially the same conditions as last week continued to prevail in this market, but the aggregate of transactions was a little larger. This was due in part to buying by domestic galvanizers. No export sales were reported during the week. There was evident a little more readiness to enter into contracts for delivery as late as July, and even as late as August when coupled with the earlier months. There was a wide range in prices realized, both according to time of delivery and according to sellers. Sales were reported for prompt metal at above the range and for distant deliveries below the range of our quotations, which average the market as nearly as we are able to do so.

Zinc sheets, base price remains $13.50 per 100 lb., f.o.b. La Salle, Ill., less 8% discount. Usual extras charged. The demand is reported good and sales large.

The La Harpe Spelter Co., of which George E. Nicholson is general manager, is now operating the smeltery at Altoona, Kan. The old plant at La Harpe, Kan., is being dismantled.

The Pittsburg Zinc Co. has resumed smelting at Pittsburg, Kan. It is reported that the old Cockerill plant, or "north smelter" at Pittsburg is to be reopened after an idleness of about 15 years, a Joplin syndicate having secured control.

The American Zinc, Lead & Smelting Co. lost the power house and pottery of its smeltery at Caney, Kan., on Apr. 3, both being burned to the ground and being a total loss. However, smelting was continued without interruption, makeshift engines supplying necessary power while retorts are obtained from Dearing. The capacity of the plant is diminished temporarily by only a little. This is fortunate, for in the present situation the industry needs all possible smelting capacity.

DAILY PRICES OF METALS IN NEW YORK

Apr.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
8	4.7963	50¼	15.80 @15.85	55	4.20 @4.25	4.15 @4.20	8.67½ @9.42½	8.50 @9.25
9	4.7988	50¼	15.80 @15.90	55 @58	4.20 @4.25	4.15 @4.20	8.67½ @9.42½	8.50 @9.25
10	4.7975	50¼	15.90 @16.10	56 @58	4.20 @4.25	4.15 @4.20	8.92½ @9.42½	8.75 @9.25
12	4.7938	50¼	16.10 @16.20	55 @58	4.10 4.20	4.10 @4.15	8.92½ @9.42½	8.75 @9.25
13	4.7913	49⅞	16.15 @16.25	55	4.10 4.20	4.10 @4.15	8.92½ @9.67½	8.75 @9.50
14	4.7931	49⅞	16.20 @16.35	55	4.10 4.2[illegible]	4.10 @4.15	8.92½ @9.67½	8.75 @9.50

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Apr.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.				
		£ per Ton	Cts. per Lb.					£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
8	23⅛	71⅛	15.53	71⅞	....	170	169	21¾	4.73	43½	9.45
9	23⅛	71⅛	15.59	72⅛	....	169	167½	21½	4.67	43½	9.45
10	23⅛	.....	.....	.....	....	.....	.....	.....	.....	.....	....
12	23⅛	72⅛	15.81	73⅛	....	169¾	168¾	20 7/16	4.39	43½	9.45
13	23½	71⅞	15.62	72⅛	....	171	169	20 11/16	4.52	44½	9.67
14	23½	72⅛	15.72	73	....	169½	168¾	20 11/16	4.52	45½	9.88

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½c.

METAL EXPORTS AND IMPORTS

Exports and Imports of Metals other than iron and steel in the United States in the month of January are reported as follows:

	Exports		Imports	
	1914	1915	1914	1915
Copper, long tons	38,164	25,982	15,803	6,649
Tin, long tons	52	30	3,485	3,101
Lead, short tons	1,363	9,532	1,295	4,385
Zinc, short tons	257	15,383	149	28
Nickel, lb.	3,501,505	3,475,318	3,831,075	2,588,046
Antimony, lb.	.....	112,438	1,531,951	2,470,903
Aluminum, lb.	.....	.....	1,231,536	1,272,291
Quicksilver, lb.	907	41,931	.....	.....
Platinum, oz.	.....	.....	6,817	2,106

Copper, lead, nickel and antimony include metallic contents of ore, matte, etc. Exports include reëxports of foreign material. Imports of zinc ore for the month this year were 1892 tons, estimated to contain 1,516,597 lb. zinc. There were no exports of domestic ore reported.

Exports and imports of secondary metallic products in the United States in January were as follows, in pounds:

	Exports		Imports	
	1914	1915	1914	1915
Copper sulphate	757,682	697,676	.....	.....
White lead	1,407,294	1,737,578	.....	.....
Zinc oxide	2,640,335	2,793,300	.....	.....
Zinc dust	6,570	86,660	332,435	153,748
Zinc dross	80,014	328,575	.....	.....

Exports include reëxports of imported material.

Foreign Mineral Trade of Spain in the month of January, as reported by "Revista Minera," in metric tons:

	Metals		Ores, etc.	
	1914	1915	1914	1915
Iron	342	14,656	642,769	271,135
Copper	1,552	263	13,655	1,004
Copper precipitate	985	161	.....	.....
Lead	16,437	12,514	120	10
Zinc	26	28	12,077	.....
Quicksilver	.....	7	.....	.....
Manganese	.....	.....	2,757	1,771
Pyrites	.....	.....	228,633	72,334

Imports of coal in 1915 were 118,749 tons; of coke, 9464 tons. Exports of salt were 54,776 tons in 1914 and 24,957 tons this year.

FERRO-ALLOYS

Quotations of ferro-alloys at Sheffield, England, last week were reported as follows: **Ferrochrome,** base 60% chromium, £25@26 per ton, according to carbon content. **Ferro Vanadium,** 33 to 40% Va, per lb. of vanadium in the alloy. **Ferrosilicon,** 45 to 50% Si,, £14 10s. per ton, with a scale of 10s. per unit. **Ferrotitanium,** 15 to 18% Ti, 6¼d. per lb.

Other Metals

NEW YORK—Apr. 14

Aluminum remains quiet, with sales and deliveries chiefly on contract, and not much new business. Quotations remain about the same, at 18¾@19c. per lb. for No. 1 ingots, New York—**Antimony** remains quiet. Supplies are limited but sales are not large. Ordinary brands—chiefly Chinese and Japanese—are sold at 23½@25c. per lb. Cookson's is held at 31@32c. per lb., nominally—**Nickel** is steady and unchanged. Ordinary forms are 40@45c. per lb., according to size and terms of order. Electrolytic, 3c. per lb. higher—**Quicksilver** is still an uneasy and unsettled market. The New York price for large lots is nominally easier at $62 per flask of 75 lb., but no sales are reported. Small lots are held at $75@80 per flask for spot delivery. London prices is £12 5s. per flask, with £12 asked from second hands. San Francisco price is telegraphed at $64.50@65; some dealers still holding at $81 for small lots.

Minor Metals—Current sales of **Bismuth** have been at $2.75@3 per lb., New York.—**Selenium**—Quotations are $2@3 per lb. for larger quantities; $4.50@5 per lb. for smaller lots.—**Cadmium** is quoted in London at 6s.—$1.44—per lb.—**Tellurium** is reported sold at 80s.—$19.20—per lb. in London.

Gold, Silver and Platinum

NEW YORK—Apr. 14

Gold in the United States April 1, as estimated by the Treasury Department: Held in Treasury against gold certificates outstanding, $1,018,714,169; in Treasury current balances, $238,298,497; in banks and circulation, $619,313,873; total, $1,876,326,539, an increase of $43,897,584 during March.

A further shipment of 1,500,000 yen, or $750,000, in gold from Japan for New York is reported. This will make about $15,000,000 gold from Japan this year.

Gold production of the Transvaal in March is reported by cable at 753,486 oz., which is 77,215 oz. more than in February and 66,635 oz. more than in March, 1914. For the three months ended Mar. 31 the total value was $40,612,726 in 1914, and $44,329,729 in 1915; an increase of $3,717,003, or 9.2%, this year.

Gold output of Rhodesia in February was 68,669 oz., being 1413 oz. less than in January and 6921 oz. more than in February, 1914. For the two months ended Feb. 28, the output was $2,867,983, being $367,740 more than in the corresponding period last year.

Silver—Continental orders have been the chief support of the market according to our last advices, without much competition from the East. Orders from India, however, are likely to cause a slight advance at any time.

Exports of silver from London to the East Jan. 1 to Mar. 31, as reported by Messrs. Pixley & Abell:

	1914	1915	Changes
India	£1,841,000	£1,528,500	D. £312,500
China	40,000	.....	D. 40,000
Total	£1,881,000	£1,528,500	D. £352,500

Coined silver in the United States April 1 as estimated by the Treasury Department: Standard dollars, $565,975,478; subsidiary coins, $185,158,009; total, $751,132,637. Of the standard dollars $498,404,000 are held in Treasury against silver certificates outstanding.

Platinum—The platinum market continues largely nominal, with sales small. Dealers ask $38@40 per oz. for refined platinum. Hard metal is $43@47 per oz. according to grade.

Our Russian correspondent writes that the market is without change. Price for small lots at Ekaterinburg is 8 rubles per zolotnik—$30.08 per oz.—for crude metal, 83% platinum. At Petrograd 31,000 rubles per pood—$30.38 per oz.—is quoted but this is nominal, as there are no sales. Export of the metal is prohibited, but the State Bank advances 23,000 rubles per pood on stocks.

At the conference of gold and platinum producers in Petrograd last month it was stated that the smaller producers have entirely stopped work. The stock of platinum is large, but it is generally in strong hands.

Zinc and Lead Ore Markets

JOPLIN, MO.—Apr. 10

Blende, high price $63; assay base 60% zinc, low in lead, $60@58; down to $54 as lead content increased; metal base, $54@46; calamine base, 40% zinc, $30@34; average, all grades of zinc, $55.36 per ton. Lead, high price, $53; base, $51@52 per ton of 80% metal content; average, all grades of lead, $51.16 per ton.

Again buying was increased on medium, also on the poorer grades, with several large purchases of best grade reserve stock. Despite the inactivity of producers, who are certain they should have a higher price, output is steadily growing as the weather improves.

SHIPMENTS WEEK ENDED Apr. 10

	Blende	Calamine	Lead	Values
Totals this week ..	11,784,780	856,060	1,457,340	$385,820
Totals this year...	149,156,630	13,158,170	22,583,130	$5,293,530

Blende value, the week, $332,920; 15 weeks, $4,511,950.
Calamine value, the week, $15,610; 15 weeks, $238,010.
Lead value, the week, $37,290; 15 weeks, $533,570.

PLATTEVILLE, WIS.—Apr. 10

The base price paid this week for 60% zinc ore was $56 per ton. The base price paid for 80% lead ore was $51 per ton.

SHIPMENTS, WEEK ENDED Apr. 10

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	3,895,700	622,400	473,540
Year	54,868,640	1,386,390	5,716,890

Shipped during week to separating plants, 4,040,700 lb. zinc ore.

Iron Trade Review

NEW YORK—Apr. 14

New business has been rather light this week. The Steel Corporation's statement shows a small decrease in unfilled orders in March, and a great effort is being made to figure out alarming prospects for the near future. This kind of prediction, made chiefly for political reasons, is not having much effect in the trade, which is still hopeful of gradual improvement.

In some lines, such as bars, sheets and plates, the demand is almost up to that of a normal year; in wire and a few other lines it is high. Structural steel orders continue light and railroad business is poor. Two rail orders, of 5000 tons each, have gone to the Sault Ste. Marie mill. The Dominion Steel Co. has taken a large rail order for Australia, to be rolled at the Sydney mills.

The pig-iron market has been quieter; most of the new business has been in Southern iron, which has sold rather freely at $9.25@9.50 Birmingham for No. 2 foundry.

The increase in pig-iron production shown by the April reports is chiefly in the steel works furnaces. The make of the merchant furnaces increases rather slowly.

Pig Iron Production showed a further increase in March. The reports of the furnaces, as collected and published by the "Iron Age," show that on Apr. 1 there were 191 coke and anthracite stacks in blast having a total daily capacity of 70,000 tons, an increase of 7550 tons over Mar. 1. Making allowance for the charcoal furnaces the total make of pig iron in the United States in March was 2,090,000 long tons; for the three months ended Mar. 31 it was 5,416,900 tons. Of this total 3,904,400 tons, or 72.1% were made by the furnaces owned or operated by steel companies.

The United States Steel Corporation reports that the total orders on its books Mar. 31 amounted to 4,255,749 tons of material of all kinds. This is 89,622 tons less than on Feb. 28, but 419,106 tons more than on Dec. 31. It is 398,076 tons less than on Mar. 31 last year.

PITTSBURGH—Apr. 13

The Steel Corporation's reported loss of 89,622 tons in unfilled obligations during March rather surprised the steel trade, as bookings in unfinished steel and in bars, plates and shapes had exceeded the shipments, and there must have been preponderating losses in other branches of the trade, particularly in lines that are out of their contracting season, like wire products and tinplate. Tinplate shipments were extraordinarily heavy in March, the corporation's shipments being the largest for any month in its history, excepting July of last year.

The steel mills are operating at fully 70% of capacity, against an average of 65% in March, and are likely to continue this rate though there is no prospect at present of their increasing it. There are indications that more structural tonnage may come out soon, and this, with anything like normal railroad requirements, would increase mill operations considerably, bringing them nearly up to capacity.

The 1.20c. price on bars, plates and shapes, established by the large mills in western Pennsylvania and Ohio April 1, is taking hold, advices in the past few days being that the eastern mills intend to quote on this basis. In plates and structural shapes the Chicago market has not come up to the new level.

Wire products have softened, and the advanced prices announced Feb. 11, making nails $1.60, are not being obtained. The $1.50 contracts, made at the beginning of the year, were supposed to expire by limitation April 1, but nails can now be bought at $1.55 if not at less.

Export orders continue good, reports being that the Steel Corporation is booking at the rate of 60,000 tons a week, or more than double the rate of last year.

Pig Iron—The local pig-iron market continues very quiet and in some quarters is believed to be softer than appears on the surface. There have been no quotable changes for many weeks, these prices being at least as low as at any time in 10 years. We quote: Bessemer, $13.60; basic, $12.50; No. 2 foundry, $12.75@13.25; malleable, $12.75; forge, $12.50@12.75, f.o.b. Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—Some shipments of ferromanganese are believed to be on the way, but reports are more or less uncertain. The steel mills are less uneasy than they were a month ago, expecting shipments to come forward in sufficient volume before stocks are exhausted. The contract price remains at $78, Baltimore, while small prompt lots command about $100.

Steel—The mills entered very large tonnages of billet and sheet bar specifications in March and will have heavier shipments this month than for six months or more. Prices are not well defined. We quote billets at $18.75@19 and sheet bars at $19@20, f.o.b. maker's mill, Youngstown, and about $1 a ton higher delivered Pittsburgh. Rods are $25, Pittsburgh, consumers being well covered at slightly lower figures.

IRON ORE

NEW YORK—Apr. 14

The March movement of Lake Superior iron ore from lower lake docks to furnaces was 648,848 tons, compared with 820,741 tons in March, 1914, 301,629 tons in February, 1915, and 249,123 tons in January, 1915. The ore on dock April 1 amounted to 6,861,840 tons, compared with 7,155,674 tons on dock April 1, last year.

Negotiations for the season's prices of Lake ores are said to be in progress, but nothing definite has yet been done. It is generally believed that prices will be the same as last season. So large a part of the ore is now mined by the companies consuming it that the prices fixed by independent miners are of much less importance than in most former years.

COKE

NEW YORK—Apr. 14

A contract is reported let to a furnace in the East for 7000 tons Pocahontas coke monthly for six months.

Connellsville—The "Courier" reports production at 281,251 tons, a decrease of 3986 tons for the week, and shipments at 278,014 tons, a decrease of 6699 tons. The market is uneventful, but maintains the stronger sentimental tone noted a week ago. Prices are approximately as follows: Prompt furnace, $1.55@1.60; contract furnace to July 1, $1.60@1.65; to Jan. 1, $1.75; prompt foundry, $2@2.35; contract foundry, $2.15@2.30, per net ton at ovens.

Anthracite Shipments in March were 4,985,398 long tons, being 710,291 tons more than in February, but 179,305 tons less than in March, 1913. For the three months ended Mar. 31 the total shipments were 14,461,886 tons in 1914, and 13,995,090 tons in 1915; a decrease of 466,796 tons, or 3.2% this year.

Fuel Exports from Great Britain, two months ended Feb. 28, in long tons:

	1914	1915	Changes
Coal	11,520,647	7,242,453	D. 4,278,194
Coke	218,851	166,893	D. 51,958
Briquettes	324,081	145,146	D. 178,935
Steamer coal	3,346,144	2,678,164	D. 667,980
Total	15,409,723	10,232,656	D. 5,177,967

Imports are insignificant, amounting only to 4355 tons in 1914 and 802 tons this year.

Chemicals

NEW YORK—Apr. 14

The general markets are steadier and business in several lines seems to be improving.

Arsenic—There is little change. The business doing is on a moderate scale and prices remain about $4 per 100 lb. for both spot and futures.

Copper Sulphate—Business is on a good scale and prices are unchanged. Current quotations are $6 per 100 lb. for carload lots, and $6.25 per 100 lb. for smaller orders.

Nitrate of Soda—Business is fair and improving on the whole. Prices are firm and 2.30c. per lb. is quoted for all positions this year.

United State consular reports state that the average monthly production of nitrates in Chile from Jan. 1 to Aug. 1, 1914, was 5,404,729 quintals of 101.4 lb. Since Aug. 1 the production, in quintals, has been as follows: August, 4,830,233; September, 2,856,600; October, 2,865,494; November, 2,659,875; December, 2,428,759; January, 1915, 2,082,549. Wages in the nitrate fields have gone down 25%, but falling exchange has increased by 40% the cost of imported articles used in the reduction of nitrates. The Government has assisted in sustaining 70% of the output. On Aug. 1, 1914, there were 134 plants in operation. On Feb. 1, 1915, there were 40, some of which were working half time. The nitrate on hand in Chile (24,000,000 quintals) is enough to supply the market for a year if monthly sales are not increased.

Pyrites—Imports at Baltimore for the week included 4633 tons of pyrites from Huelva, Spain.

Imports and Exports of Chemicals in the United States in the month of January, in pounds:

	Imports		Exports	
	1914	1915	1914	1915
Arsenic	532,243	579,659	.....	.....
Bleach	5,365,604	1,793,591	.....	.....
Potash salts	3,595,832	7,209,587	186,686	5,547
Acetate of lime	.....	.....	4,251,499	2,040,010
Calcium carbide	.....	.....	3,420,755	2,837,196

Exports include reëxports of foreign material. Imports of soda salts not given in quantity; values were $58,321 in 1914, and $99,769 in 1915. Potash salts do not include those imported as fertilizers.

Imports and exports of raw material for chemical manufacture in the month of January, in long tons:

	Imports		Exports	
	1914	1915	1914	1915
Sulphur	1,685	410	2,761	164
Pyrites	86,458	38,386	.....	.....
Chrome ore	10,320	.....	.....	.....
Magnesite	17,230	5,520	341	.....

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total sulphur imported this year was 15,764 tons.

Assessments

Company	Delinqe	Sale	Amt.
Andes Silver, Nev.	May 4	May 25	$0.03
Big Elk, Ida.	Apr. 15	May 15	0.001
Bobby Anderson, Ida.	Apr. 12	May 3	0.0025
Challenge, Nev.	Mar. 31	Apr. 21	0.05
Consolidated Imperial, Nev.	Apr. 27	May 18	0.01
Con. Virginia, Nev.	May 4	May 25	0.10
Diam'field Black Butte, Nev.	Apr. 30	June 3	0.01
Eastern Star, Ida.	Mar. 25	Apr. 25	0.002
Emerald, Utah (three instal.)	.....	June 9	0.01
Enterprise, Ida.	Mar. 20	Apr. 20	0.002
Florence, Ida.	Apr. 15	May 4	0.001
Galena King, Utah.	Mar. 25	Apr. 25	0.0075
Gethin Le Roy, Utah.	Apr. 21	May 6	0.01
Giant, Ida.	Apr. 9	May 14	0.002
Great Falls, Utah.	Mar. 18	Apr. 22	0.01
Idaho-Los Angeles, Ida.	Apr. 24	May 15	0.005
Index, Ida. (post.)	.....	Apr. 24	0.005
Ivanhoe, Ida.	Apr. 10	May 10	0.002
Jack Waite, Ida. (post.)	.....	Apr. 23	0.01
Lake Superior & West., Ariz.	.....	.....	0.10
Lucky Boy, Nev.	Apr. 9	Apr. 28	0.01
Majestic-Idol, Nev.	Dec. 15	Jul. 20	0.005
Mullan, Ida.	Apr. 24	May 24	0.002
Mountain Rose, Ida.	Apr. 19	May 19	0.001
Nevada-Douglas, Nev.	Apr. 24	June 10	0.10
Old Veteran, Ida.	.....	.....	0.002
Oreano, Ida.	Mar. 25	Apr. 26	0.0015
Pandora, Ida.	Apr. 15	May 7	0.003
Pioche Metals.	Mar. 20	Apr. 20	0.0025
Raven, Ida.	May 15	June 14	0.0006
Rio Grande, Utah.	Mar. 25	Apr. 17	0.003
Samson, Ida.	Apr. 3	May 3	0.002
Sandstorm Kendall, Nev.	Apr. 1	May 6	0.01
Silver Cliff, Ida.	Apr. 3	Apr. 24	0.0025
Smuggler	Apr. 17	May 17	0.0025
Sonora, Ida.	Mar. 15	Apr. 15	0.002
Sunset, M. & D., Nev.	Mar. 27	May 3	0.015
Tar Baby, Utah.	Mar. 5	Apr. 5	0.005
Tarbox, Ida.	Apr. 26	May 28	0.0025
Tonopah Midway, Nev.	Mar. 12	Apr. 12	0.01
Union, Nev.	Apr. 6	Apr. 28	0.05
Utah, Nev.	Mar. 25	Apr. 15	0.02
Wolf Mountain, Utah.	Mar. 15	Apr. 14	0.0015

Stock Quotations

In sales at auction we note: 100 shares Humboldt Mining Co. ($100 par), $100 lot, and 100,000 shares Ebner Gold Mining Co. ($5 par), $200 lot.

COLO. SPRINGS Apr. 13		SALT LAKE Apr. 13	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.04½	Beck Tunnel	.07
Banner	.01½	Black Jack	.10
Cripple Cr'k Con.	.01	Colorado Mining	.12½
C. K. & N.	.06½	Crown Point	.02
Doctor Jack Pot.	.08½	Daly-Judge	5.25
Elkton Con.	.43¾	Gold Chain	.09½
El Paso	1.27	Grand Central	.55
Findlay	.03	Iron Blossom	.99
Gold Dollar	.04¾	Little Bell	.12
Gold Sovereign	.04½	Lower Mammoth	.05
Isabella	.15½	Mason Valley	2.75
Jack Pot	.06	May Day	.13
Jennie Sample	‡.02	Opohongo	.01½
Jerry Johnson	.03½	Prince Con	.39
Lexington	.008	Seven Troughs	.02
Mary McKinney	.32	Silver King Coal'n	3.05
Pharmacist	‡.02	Silver King Con.	1.75
Portland	1.15	Sioux Con.	.03
Raven B. H.	.03½	Uncle Sam	.03½
Vindicator	1.64	Yankee	.05

TORONTO Apr. 13			
Bailey	.02½	Dome Exten.	.11
Coniagas	4.75	Foley O'Brien	.25
Peterson Lake	.21	Hollinger	24.00
Right of Way	.02	Imperial	.05
Seneca Superior	1.25	Jupiter	.15
Silver Queen	.01½	McIntyre	.50
T. & Hudson Bay	20.00	Pearl Lake	.01½
Timiskaming	.37	Porcu. Gold	‡.25
Wettlaufer-Lor.	.04	Preston E. D.	.04½
Big Dome	12.75	Rea	.10

SAN FRANCISCO Apr. 13			
Comstock Stocks		Misc. Nev. & Cal.	
Alta	‡.04	Belmont	4.50
Belcher	.20	Jim Butler	.87
Best & Belcher	.04	Lone Star	.09
Caledonia	.23	MacNamara	.04
Challenge Con.	‡.06	Midway	.16½
Confidence	.15	Mont.-Tonopah	.42
Con. Virginia	.06	North Star	.16
Crown Point (Nev.)	‡.32	Rescue Eula	.10
Gould & Curry	.02	West End Con.	.75
Hale & Norcross	.04	Atlanta	.41
Julia	‡.01	Booth	.42
Mexican	.31	C.O.D. Con	.05
Occidental	.79	Comb. Frac	.13
Ophir	.06	Jumbo Extension	1.30
Overman	‡.10	Pitts.-Silver Peak	.12
Potosi	‡.01	Round Mountain	.36
Savage	.05	Sandstorm Kendall	.11
Sierra Nevada	.06	Silver Pick	.11
Union Con.	.20	Central Eureka	.17
Yellow Jacket	.38	So. Eureka	‡2.25

N. Y. EXCH. Apr. 13	
Name of Comp.	Clg.
Amalgamated	70⅛
Am.Sm.&Ref.,com	71
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf. B.	79½
Anaconda	35½
Batopilas Min.	.50
Bethlehem Steel	125
Bethlehem Steel, pf.	110½
Chino	42⅛
Colo. Fuel & Iron	32
Federal M. & S., pf.	25
Great Nor., ore., ctf.	39½
Guggen. Exp.	57⅜
Homestake	115½
Inspiration Con.	30½
Mex. Petroleum	75½
Miami Copper	24½
Nat'l Lead, com.	63½
National Lead, pf.	109⅞
Nev. Consol.	14⅜
Ontario Min.	2½
Phelps Dodge	‡175
Quicksilver, pf.	1½
Ray Con.	22
Republic I&S, com.	26½
Republic I&S, pf.	84
SlossSheffi'd, com.	36
Tennessee Copper	32½
Utah Copper	62½
U. S. Steel, com.	56½
U. S. Steel, pf.	108½

N. Y. CURB Apr. 13	
Name of Comp.	Clg.
Alaska Juneau, w.i.	15½
Beaver Con.	.37
Big Four	.07
Blue Bell	.05
Braden Copper	8⅛
Buffalo Mines	.40
Can. Cop. Corpn.	1½
Can. G. & S.	.04
Caribou	.55
Cashboy	.09
Chambers Ferland	.24
Con. Ariz. Sm.	1 1/16
Con. Coppermines	2 1/16
Davis-Daly	1¼
Diam'field-Daisy	.08
Dia. Black B.	.03
Florence	.65
Goldfield Con.	1⅛
Goldfield Merger	.28
Greene Cananea	30⅛
Kerr Lake	4⅛
La Rose	9/16
McKinley-Dar-Sa.	.34
Mines of Am.	2⅛
Nevada Hills	.28
New Utah Bingham	.97
Nipissing Mines	6⅛
Ohio Copper	.27
Oro	.12⅛
Pacific Smelt.	‡.09⅜
South Utah	‡.25
Stand'd Oil of N.J.	403
Standard S. L.	1⅛
Stewart	1 1/16
Tonopah	7⅛
Tonopah Ex.	3 7/16
Tonopah Merger	.42
Tularosa	5/16
West End Ex.	.06
Yukon Gold	2⅛

LONDON Mar. 31			
Alaska Tre'dwell	£7	7s	6d
Camp Bird	0	6	3
El Oro	0	8	0
Esperanza	0	8	6
Mexico Mines	3	17	6
Oroville	0	12	0
Philippine Dr.	1	0	0
Santa Gert'dis.	0	8	6
Tomboy	1	4	6
Tough Oakes	0	14	0

BOSTON EXCH Apr. 13	
Name of Comp.	Clg.
Adventure	2⅜
Ahmeek	‡320
Alaska Gold M.	36
Algomah	2¼
Allouez	47½
Am. Zinc	30½
Ariz. Com., ctfs.	5⅛
Bonanza	.35
Butte-Ballaklava	3
Butte & Superior	47½
Calumet & Ariz.	65
Calumet & Hecla	485
Centennial	19⅜
Cliff	‡1
Copper Range	53½
Daly West	‡2⅛
East Butte	12½
Franklin	8⅛
Granby	78⅛
Hancock	14⅛
Hedley	‡26⅛
Helvetia	‡.75
Indiana	6⅛
Island Cr'k, com.	44½
Island Cr'k, pfd.	87
Isle Royale	25½
Keweenaw	‡3
Lake	10⅛
La Salle	5½
Mass	9½
Mayflower	5½
Michigan	1
Mohawk	68
New Arcadian	7½
North Butte	32⅛
North Lake	3
Ojibway	1⅛
Old Colony	5½
Old Dominion	49⅛
Osceola	77
Quincy	75
Santa Fe	1⅛
Shannon	8½
Shattuck-Ariz.	27½
Superior	31⅛
Superior & Bost.	2
Tamarack	36
Trinity	4⅛
Tuolumne	.55
U. S. Smelting	29
U. S. Smelt'g, pf.	45
Utah Apex	3⅛
Utah Con.	10⅛
Victoria	‡1⅛
Winona	3
Wolverine	49
Wyandot	.90

BOSTON CURB Apr. 13	
Name of Comp.	Bid.
Alvarado	.60
Bingham Mines	5¼
Boston Ely	.24
Butte & Lon'n Dev.	.28
Calaveras	1⅛
Calumet-Corbin	.13
Chief Con.	.95
Corbin	.40
Cortez	.20
Crown Reserve	.85
Eagle & Blue Bell	.98
First Nat. Cop.	2⅛
Houghton Copper	2⅛
Iron Cap Cop., pf.	4
Majestic	.20
Mexican Metals	.19
Nevada-Douglas	.49
New Baltic	2 9/16
Oneco	1⅛
Raven Copper	.07
Smokey Dev.	.35
So. Lake	8⅛
Tonopah Victor	‡.17
Trethewey	.10
United Verde Ext.	2 1/16

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.490	58.519	.....	27.416	26.958	.....
May	60.361	58.175	.....	27.825	26.704	.....
June	58.990	56.471	.....	27.199	25.948	.....
July	58.721	54.678	.....	27.074	25.219	.....
August	59.293	54.344	.....	27.335	25.979	.....
September	60.640	53.290	.....	27.986	24.260	.....
October	60.793	50.654	.....	28.083	23.199	.....
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.491	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64. 76	66.152	69.170	*
April	14.211	.....	64.747	.....	69.313	.....
May	13.996	.....	63.182	.....	67.786	.....
June	13.603	.....	61.336	.....	66.274	.....
July	13.223	.....	60.540	.....	64.955	.....
August	*	.....	‡	.....	‡	.....
September	*	.....	‡	.....	‡	.....
October	*	.....	‡	.....	‡	.....
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	.....	.....	.....	.....	.....	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	.....	163.963	.....
May	33.360	.....	150.702	.....
June	30.577	.....	138.321	.....
July	31.707	.....	142.517	.....
August	*	.....	‡	.....
September	32.675	.....	‡	.....
October	30.284	.....	‡	.....
November	33.304	.....	139.391	.....
December	33.601	.....	147.102	.....
Av. year	34.301	.....	.....	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	.....	3.688	.....	18.225	.....
May	3.900	.....	3.808	.....	18.503	.....
June	3.900	.....	3.810	.....	19.411	.....
July	3.891	.....	3.738	.....	19.051	.....
August	3.875	.....	3.715	.....	‡	.....
September	3.828	.....	3.658	.....	‡	.....
October	3.528	.....	3.384	.....	‡	.....
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	.....	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	.....	4.963	.....	21.569	.....
May	5.074	.....	4.924	.....	21.393	.....
June	5.000	.....	4.850	.....	21.345	.....
July	4.920	.....	4.770	.....	21.568	.....
August	5.568	.....	5.418	.....	‡	.....
September	5.380	.....	5.230	.....	‡	.....
October	4.909	.....	4.750	.....	‡	.....
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.061	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15.07	14.55	13.94	13.45	14.10	13.95
April	14.90	.....	13.90	.....	14.13	.....
May	14.90	.....	13.90	.....	14.27	.....
June	14.90	.....	13.90	.....	13.96	.....
July	14.90	.....	13.90	.....	13.90	.....
August	14.90	.....	13.90	.....	14.08	.....
September	14.90	.....	13.90	.....	14.03	.....
October	14.84	.....	13.75	.....	13.97	.....
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....